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# China Report

SCIENCE AND TECHNOLOGY

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15 March 1985

## CHINA REPORT

### SCIENCE AND TECHNOLOGY

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## NATIONAL DEVELOPMENTS

### HU YAOBANG, ZHAO ZIYANG RECEIVE SCIENTISTS

OW051243 Beijing XINHUA Domestic Service in Chinese 1635 GMT 4 Feb 85

[By reporter Gu Wenfu]

[Text] Beijing, 4 Feb (XINHUA)--Hu Yaobang, general secretary of the CPC Central Committee, and Zhao Ziyang, premier of the State Council, this afternoon invited six scientists and technicians, who had made outstanding contributions to the program of the four modernizations, to Zhongnanhai. They discussed the question of China's scientific and technological policy, and the development of science and technology in our country.

The six scientists and technicians were Gao Ge, Ning Huang, Cao Minghua, Huang Tongnian, Zhao Naigang, and Zhang Wencai. On 13 January, when meeting with scientists attending the forum on reform of the scientific and technological management system, Hu Yaobang said that the comrades of the central organs would have more contacts with scientists from then on. Today's meeting was a result of this remark.

Hu Yaobang, Zhao Ziyang, and other leading comrades at the central level, namely Fang Yi, Hu Qili, and Zhang Aiping, spoke at this discussion meeting. They pointed out: China's current policy on science and technology is to apply, quickly and extensively, the results of scientific and technological research to economic construction, and translate them into productive forces. In recent years, the CPC Central Committee and the State Council have stressed this policy. To transform the world, we should, first of all, understand it, and the only purpose in understanding the world is to transform it. In conducting scientific research, our scientists and technicians should not merely aim at doing successful research work without putting results to use, like a plant which flowers but bears no fruit. The development of the economic situation in our country depends on two things: One is the correct policy; the other is science and technology. Now, the policy has conspicuously manifested its effects on economic development, but the role of science and technology in this respect has as yet to be brought into full play.

The leading comrades at the central level said that they were glad to meet with these six scientists and technicians, because the latter's scientific research work had not only flowered, but also borne fruit. That is, their scientific research achievements had been applied to production and construction with great economic results. In conversations with the scientists and technicians,

the leading comrades at the central level expressed the hope that scientists engaged in basic theoretical studies would pay special attention to those research projects which are closely linked with application and technological development. They hoped that all scientific and technological workers, middle-aged and young workers in particular, would do scientific research work with a view to solving the practical problems in economic construction, to contribute to the attainment of the goal of quadrupling the annual gross national product [guo min sheng chan nian zong zhi 0948 3046 3932 3934 1628 4920 0237] by the end of this century.

The leading comrades at the central level said: The central authorities have placed their hope on the present scientific and technological work force, especially middle-aged and young scientists, in our country. It is hoped that old and new scientists of all schools will unite as one, display still greater creativity, and make even larger contributions to the modernization of our country's science and technology, and to making the motherland prosperous, affluent, and powerful.

Today's meeting took place in the Qinzheng Palace in Zhongnanhai. The leading comrades at the central level and responsible persons of the departments concerned sat with the scientists and technicians in a circle, and chatted freely. The atmosphere was warm and lively.

Gao Ge and Cao Minghua, who attended the meeting today, are both middle-aged lecturers of the Beijing Aeronautics Institute. Under the direction of the guiding professor, Ning Huang, they developed a new flame stabilizer for engines. For this, they won a first-class national invention award.

Huang Tongnian, middle-aged deputy chief engineer of the Chengdu Tools Research Institute, developed a new gear-testing device, which works with an efficiency more than 30 times higher than the conventional testing method.

Zhao Naigang, middle-aged deputy chief engineer of the Anhui Provincial Department of Agriculture, Animal Husbandry, and Fisheries, created a new technique for breeding freshwater crabs in China's hinterland. The new technique has the advantage of a higher survival rate for young crabs.

Zhang Wencai, now 80, is a professor of the Huazhong Agricultural College. He has spent 50 years developing China's citrus production, and has traveled through more than half of China. At today's meeting, the leading comrades at the central level discussed and studied with him the question of how to develop new varieties of citrus fruit, and increase their output.

After the meeting, Hu Yaobang and Zhao Ziyang took dinner with the scientists and technicians.

Responsible persons of the departments concerned, namely Zhou Peiyuan, Song Jian, Chen Bin, He Kang, He Wenzhi, Zhang Wensong, and Zhao Mingsheng, were also present at the meeting and dinner.

## NATIONAL DEVELOPMENTS

### HAN PEIXIN CONGRATULATES SENIOR SCIENTISTS

OW132350 Nanjing Jiangsu Provincial Service in Mandarin 1100 GMT 12 Feb 85

[Excerpts] The Nanjing chapter of the Academy of Sciences of China held a meeting this morning to commend eight senior scientists and experts in the Nanjing area who have dedicated over 50 years to scientific research. Leading comrades of the Jiangsu Provincial CPC Committee, the provincial Advisory Committee Han Peixin, Sun Han, Xin Shaobo, Ye Xutai, Qian Zhonghan, and Yang Yongyi, as well as members of the Scientific Council of the Academy of Sciences of China and noted personages of scientific and educational circles in Jiangsu Province and Nanjing city--a total of 200 people--were present at the meeting to extend congratulations.

Comrade Sun Han spoke at the meeting on behalf of the provincial party committee and the provincial government. He said: The senior scientists have made great contributions to the motherland's scientific development, economic construction, and training of able people over the past 50 years or more.

Comrade Sun Han also pointed out: Through commendation of the eight senior scientists, we wish to publicize in society the need for respecting knowledge and talented people.

Hu Yongchang, deputy secretary general of the Academy of Sciences of China, also addressed the meeting and read out congratulatory letters by President of the Academy of Sciences of China Lu Jiaxi and Vice President Yan Dongsheng. The 83-year-old (Zhang Yude), representative of the senior scientists, and others also spoke at the meeting.

CSO: 4008/229

## NATIONAL DEVELOPMENTS

### CHEN GUODONG AT MEETING FOR VETERAN SCIENTISTS

OW120133 Shanghai City Service in Mandarin 0100 GMT 10 Feb 85

[Text] The Shanghai branch of the Chinese Academy of Sciences [CAS] held a solemn meeting in the auditorium of the municipal CPPCC committee here yesterday afternoon, marking 50 years of research work of a number of veteran scientists. The meeting commended and honored 20 celebrated veteran scientists.

Decorated with lanterns and colorful streamers, the municipal CPPCC committee's auditorium was permeated with an atmosphere of joy yesterday. The veteran scientists, who had red flowers pinned on their topcoats, were greeted with warm applause when they arrived at the auditorium. They included Feng Depei, Wang Yinglai, Zhang Xiangtong, Wang You, Yin Hongzhang, Zhuang Xiaohui, Huang Yaoceng, and Gao Yisheng.

Those present to congratulate them included Chen Guodong, Yang Di, Ruan Chongwu, Wu Bangguo, Li Guohao, Zhao Zukang, and other leading comrades of the Shanghai Municipal CPC Committee, the municipal people's congress Standing Committee, the municipal people's government, and the municipal CPPCC committee.

Leading comrades of the CAS and its Shanghai Branch presented certificates of honor and souvenirs to the veteran scientists. Messages and letters of congratulations from State Councillor Zhang Jingfu and CAS President Lu Jiaxi and Vice President Yan Dongsheng were read at the meeting.

Comrade Ruan Chongwu, on behalf of the Shanghai Municipal CPC Committee and the municipal people's government, warmly congratulated the veteran scientists. Several of these scientists made impromptu speeches and cited poems, pledging to contribute their remaining years to the motherland's four modernizations.

CSO: 4008/229

## NATIONAL DEVELOPMENTS

### REFORM OF S&T SYSTEM IN ZHEJIANG REPORTED

Beijing GUANGMING RIBAO in Chinese 19 Nov 84 p 2

[Text] Zhejiang Province has made remarkable achievements in its experiments in the reform of its scientific and technological system. According to a survey, 19 research institutes throughout the province have adjusted the internal organization of the institutes and set up various kinds of responsibility systems focusing on scientific research, which has strengthened the scientific research management of the institutes and fully shown the advantages of changing the system of operating expenses into a paid contract system.

The reform promotes the integration of scientific research with production. For example, the Hangzhou Automation Institute with the Hangzhou Chinese Character Information Equipment Plant and the Ministry of Machine-Building Industry's Yangheng Precision Electronic Watch Plant in Guiyang set up a scientific production system. In June of this year they established the "Hangxing Computer Limited Company" with Hong Kong merchants. For the contracted tasks with this integrated body and the company alone, the institute had made 200,000 yuan profit by October.

The reform has brought vitality to the research institutes. Due to the implementation of a contract responsibility system, a situation of "three more and three less" has appeared. That is, more people are taking the initiative to look for tasks and fewer people are waiting for their superiors to assign them tasks; more people are working on their jobs diligently and fewer people are fooling around; more people are pursuing efficiency and benefits and fewer people are wasteful. The situation is manifested concretely as: scientists and technologists, one by one, become socialized and "look for rice to cook" on their own initiative by contracting tasks. For example, the Provincial Chemical Engineering Institute has signed 36 task contracts with outside organizations for 800,000 yuan. The number of tasks and the budget are 3 times and 27 times respectively more than those contracted during the same period last year. The scientific research tasks which the Provincial Smelting Institute contracted from January to September this year is 30 percent over that of last year. Second, the practice of a paid contract system has increased the scientific research units' income. The net profit of Hangzhou City's Automation Institute by economic forecasts should reach 800,000 yuan this year,



more than 20 percent over that of 1983. The Laboratory Factory I of Wenzhou City's industrial Science Institute, since it has implemented the contract system, produced a 600,000 yuan total output value of magnet pumps, almost double that of last year. Third, as a result of the reforms, the "big pot" is smashed and the enthusiasm of scientists and technologists is greatly mobilized. The provincial Metallurgical Institute has compared tasks in the past to "being unable to eat any more" and now "not having enough to eat." Quite a few research labs have surplus people to contract more tasks. An analysis lab, for example, which received 28,000 yuan for technical services last year, receives 40,000 yuan this year. Fourth, the time required for scientific research and production is shortened and the popularization and application ratio of achievements is increased. Wenzhou City's Industrial Science Institute has contracted 22 tasks this year. Most of the tasks can be completed as is agreed in the contract and put into production. It is estimated that the institute can receive 150,000 yuan during the first year of reform, 400 percent over the total income of scientific research contracts in the last 4 years. The provincial Metallurgical Institute organized the over 100 scientists and technologists it had in the institute to work on the key project "to use powdered chromium pellets in smelting Lerrrodrome alloy" which it has contracted with the state Science Commission. After 3 months of hard work, the institute achieved the Ministry of Metallurgy's requirements for chief technical and economic indexes and completed the task successfully.

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CSO: 4008/142

## NATIONAL DEVELOPMENTS

### SHANGHAI CENTER OFFERS CONSULTANCY SERVICES

OW230811 Beijing XINHUA in English 0724 GMT 23 Feb 85

[Text] Shanghai, 23 February (XINHUA)--Shanghai, China's biggest scientific and technical center, sent 239 groups of 971 scientists and technicians to other parts of the country last year to help with local economic development, according to the city's science association.

They offered consultancy services on 369 projects in 17 provinces, autonomous regions and municipalities.

Their services range from formulation of long-term development plans to training of personnel and trial manufacture of new products.

The city set up a science and technical service center in September 1983 to coordinate efforts of 108 societies and associations. It now has 86 branches and five companies under it.

The center sponsored a fair last June on environmental protection techniques. In 11 days, the fair received visitors from 1,173 medium-sized and small enterprises across China and offered consultancy on 1,863 technical problems.

The center last year ran a training class on coal powder for technicians from 28 provinces, autonomous regions and municipalities.

CSO: 4010/93

## NATIONAL DEVELOPMENTS

### SHANGHAI ATOMIC NUCLEUS INSTITUTE REVISES RESEARCH TOPICS

Beijing RENMIN RIBAO in Chinese 7 Aug 84 p 3

[Article by Wu Mingfei [6762 7886 7378] the Shanghai Atomic Nucleus Institute Revises Scientific Research Topics in Spirit of Reform.]

[Text] The Atomic Nucleus Institute of the Chinese Academy of Sciences, using the revision of scientific research topics as the breakthrough in the reform of scientific research management, recently cancelled and reduced 47 research topics which did not have much practical value or which had not had any result over a long period of time.

During the reform, the institute sorted out the 118 research topics it had this year. Topics that were eliminated were in four categories: 1. Topics that did not have much economic or academic significance; 2. Topics that duplicated other units in the institute; 3. Topics that did not have any result over a long period of time and did not have any prospect for development; 4. Topics that were obviously beyond the institute's ability and could not be completed. While cancelling these research topics, the institute persisted in doing good ideological work on the people involved and thus made the adjustment work easier.

After the research topics have been sorted out and revised, the conflict that existed due to the shortage of personnel and equipment was alleviated. According to statistics, the research labs were originally asking for over 30 more scientists and technologists. After the cancellation of some research topics, however, there were over 20 surplus scientists and technologists who could participate in other research topics. In the past, there were not enough large-scale research equipment such as cyclotrons and multi-channelled computer systems due to the large number of research topics. As a result, some scientific research work was affected. Now, scientists and technologists rarely have to worry about equipment.

By revising research topics, the institute determined 10 topics which have significant meaning or have significant scientific value as key research projects. The planning department of the institute has signed contracts with the concerned task groups guaranteeing that it will give priority for support of man-power, funds and materials so that they can strive to have some achievements this year or within a few years.

## NATIONAL DEVELOPMENTS

### SCIENCES ACADEMY FOSTERS LOCAL COOPERATION

OW211445 Beijing XINHUA Domestic Service in Chinese 0758 GMT 20 Feb 85

[By reporter Zhuo Peirong]

[Excerpts] Beijing, 20 Feb (XINHUA)--Since 1983 the Academy of Sciences of China, in a move to orient scientific and technological research toward economic construction, has successively established long- and short-term scientific and technological cooperation with many localities and units. Presently the academy has established long-term scientific and technological ties with Beijing, Tianjin, Shanxi, Hunan, Sichuan and Xinjiang as well as with departments in charge of economic work under the Ministries of Petroleum Industry and Coal Industry. It has also signed various cooperation agreements with many prefectures and cities and large and medium-sized enterprises. Over the past 2 years the academy has transferred over 1,100 technologies to these localities throughout the country.

The first province to establish cooperation ties with the academy was Shanxi Province. In October 1983 the two sides signed an agreement on the popularization of 38 research results in Shanxi Province. Most of these research results dealt with the exploitation of coal resources and the development of agriculture. Later the academy also concluded a long-term agreement with Sichuan Province on the survey and exploitation of natural resources in Panzhihua area and on technology for mining complex ores. The academy recently also signed agreements with Hunan Province on running technology development corporations in cooperation with localities, on the exchange of scientific and technological information, and on the training of technological personnel urgently needed by localities for production.

Thirty-five research institutes of the Academy of Sciences of China also fostered cooperation with 28 units of the Ministry of Petroleum Industry in over 140 research projects. The two sides evaluated oil deposits at the Kekeya oilfield in Xinjiang in 1984. Drillings have borne out the analysis made by the two sides concerning the oilfield. As a result, the oilfield produced industrial oil last year.

Many of the research institutes of the academy also established over 70 technological development corporations or combined production undertakings in cooperation with local enterprises and other economic units over the past 20 years. These corporations and undertakings have greatly promoted the development of local industries.

## NATIONAL DEVELOPMENTS

### BEIJING, CAS SIGN PROTOCOL ON S&T COOPERATION

OW160615 Beijing XINHUA Domestic Service in Chinese 1701 GMT 15 Feb 85

[By reporter Huang Wei]

[Text] Beijing, 15 Feb (XINHUA)--At a ceremony this morning, the Beijing Municipal People's Government and the Chinese Academy of Sciences [CAS] signed a protocol on establishing relations of full-scale and long-range scientific and technical cooperation. Beijing Vice Mayor Zhang Jianmin and CAS Secretary General Gu Yijian signed the protocol.

Beijing and the CAS hope that, by establishing scientific and technical cooperation relations, they can work together to give fuller play to the capital's scientific and technical forces, deal with major scientific and technical problems arising from construction in the capital, and build the capital together. The scope of their cooperation covers studying and implementing the strategy of Beijing's economic and technological development, carrying out [words indistinct] of Beijing's major trades and professions; and improving the conditions for the capital's communications, telecommunications, environmental preservation, development of satellite cities, and so forth.

Their bilateral cooperation projects are: The CAS, in accordance with its capabilities as well as the priorities stipulated in the "General Program for Construction in the Capital," will work out its research plans, and Beijing will actively support these research plans by providing the necessary information and other conditions; according to its needs, Beijing will put forward research projects and request units under the CAS to study them, or will study these projects with them; the CAS will enjoy priority in transferring and extending its research accomplishments in Beijing; and enterprises in Beijing and corresponding specialized departments under the CAS may establish all forms of joint research-production establishments.

CSO: 4008/243

## NATIONAL DEVELOPMENTS

### SCIENCE ACADEMY SEEKS TO SERVE CONSTRUCTION

OW210852 Beijing XINHUA in English 0711 GMT 21 Feb 85

[Text] Beijing, 21 February (XINHUA)--The Chinese Academy of Sciences is seeking closer cooperation with local governments and factories to better serve the needs of China's economic construction, according to an academy spokesman here today.

Long-term technical and scientific agreements have been signed with the municipalities of Beijing and Tianjin, Shanxi, Hunan and Sichuan provinces, the Xinjiang Uygur Autonomous Region, and a number of ministries.

One agreement signed in 1983 obliges the academy to help Shanxi Province develop coal mining technology, the spokesman said. The province furnishes about one fifth of China's coal output.

Further agreements with the petroleum industry involve 140 research projects. One carried in 1984 resulted in the sinking of a number of wells of commercial value in a new oilfield in Xinjiang.

The Ministry of Geology now can count on the academy for help with problems in the development of oilfields and crude oil transport.

Academy research institutes have also helped establish more than 70 technological development companies and other businesses to boost local industries.

The agreements were all part of the current reform drive being carried out in China's scientific and research institutions, the spokesman said.

CSO: 4010/93

## NATIONAL DEVELOPMENTS

### REDUCING RED TAPE BOOSTS TECHNOLOGY IMPORTS

OW170712 Beijing XINHUA in English 0651 GMT 17 Feb 85

[Text] Beijing, 17 February (XINHUA)--Reduction of red-tape has brought about a boom in the import of technology in Tianjin and Shanghai, according to local reports.

Shanghai, the biggest of the 14 coastal cities opened to the outside world, has signed contracts for more than 80 joint venture and cooperation schemes since the beginning of last year. They involve a total foreign capital of U.S. \$900 million, twice as much for the previous 5 years.

Steps to improve work efficiency have been taken by the municipal foreign trade and economic relations authorities, local officials say.

The Shanghai Yilian Textile Mill, a joint venture, was completed in just a little over 3 months, from the day the proposal was put forward to the arrival of imported equipment.

Previously, the application for starting a joint venture had to travel a long way through government departments and be stamped as many as several dozen times before it was approved. It often took months or even years to complete the procedure. Now it takes just a few days.

Shanghai has received more than 90 governmental trade missions and 20,000 representatives from overseas firms in the past year. The most active were business people from the United States, followed by those from Hong Kong and West European countries.

To facilitate the obtaining of foreign investment, the city has opened a dozen new channels and run crash courses to train personnel in trade and foreign economic relations.

North China's Tianjin has imported 281 items of technology involving a total of U.S. \$270. Most of them were concluded in the latter half of 1984 when the power of approval was decentralized. The number of transactions concluded last year was almost equivalent to the total for the previous 5 years.

It took the city printing and decoration industry company only 3 days to complete the procedure of obtaining approval and bank loans for a U.S. \$480,000-plant.

In the past, the company had to wait for 2 years to get a U.S. \$180,000 import project approved. The application of a factory for importing a piece of equipment usually had to be stamped 39 times before it was approved. Now, it needs to be stamped only five times.

The city has retooled 108 major factories with imported technology and equipment and the technical processes for making color television, rubber, food-stuffs and products in eight other industries have been updated.

CSO: 4010/93



## NATIONAL DEVELOPMENTS

### BRIEFS

LI LIAN ATTENDS SCIENTIFIC MARKET--The Heilongjiang provincial scientific and technological market opened today at the provincial exhibition hall in Harbin. Attending and congratulating the opening were Li Lian, secretary of the provincial CPC committee; Zhu Dianming, standing committee member of the provincial CPC committee and director of the provincial scientific and technological commission; and Wang Lianzheng, vice governor of the province. Sponsored by the provincial scientific and technological development and exchange center, the provincial scientific and technological market is a permanent place for developing science, technology, and trade; displaying and exchanging the new scientific and technological achievements scored within and outside the province; organizing royalties for patents; inviting bids; organizing cooperations to solve problems; exchanging talented personnel; and rendering scientific and technological advice and information. [Excerpt] [Harbin Heilongjiang Provincial Service in Mandarin 1000 GMT 13 Feb 85]

LIAONING SCIENTIFIC-TECHNICAL RESEARCH--In 1984, 429,000 scientific and technical personnel throughout Liaoning Province rendered marked advisory service in scientific and technological fields. They completed more than 6,700 advisory projects, which realized 1.06 billion yuan of direct economic returns. According to incomplete statistics, by the end of 1984 12 cities across the province established scientific and technical service centers enabling the number of such service units at all levels to reach 755 and the number of full-time and part-time cadres to reach more than 2,100 people. [Excerpt] [Shenyang Liaoning Provincial Service in Mandarin 1030 GMT 16 Feb 85 SK]

CSO: 4008/243

## APPLIED SCIENCES

### PRC ELECTRONICS STANDARDIZATION WORK REVIEWED

Beijing ZHONGGUO BIAOZHUNHUA [CHINA STANDARDIZATION] in Chinese No 10, 1984, pp 13-18

[Article by the Standardization Research Institute of the Ministry of Electronics Industry: "Major Achievements in Standardization Work in the Electronics Industry Since the Founding of the People's Republic of China"]

[Text] For 35 years, under the leadership of the PRC, the Chinese people have gone through an arduous struggle, obtaining glorious results, with earth-shaking changes occurring in all trades and professions. The broad ranks of fighters on the front lines of our electronics industry standardization work are enthusiastically celebrating this glorious holiday.

In the 35 years since liberation, under the loving care of the party and the government, China's electronics industry standardization work has accompanied the development of the industry in going from a condition of wanting to having, from small to large, from an intensive study of foreign standards to the formulation of our own. A system of standards for the electronics industry has developed progressively, while a standardization work system is beginning to take shape. These developments are now starting to be of positive use in advancing the development of the electronics industry and in improving the quality of electronic products.

The development of electronics industry standardization work has followed a tortuous path; in summing it up, we can divide it into the following several time periods:

#### 1. The founding period (from liberation to 1957)

Electronics is a young, newly emerging industry in China. Before liberation, it consisted of only a few small-scale factories which were semi-colonial in nature, capable of carrying out only simple repairs, an industry incapable of having its own standards. After the founding of the PRC, the industry went through 3 years of recovery, especially during the First 5-year Plan. In addition to upgrading existing enterprises from mere maintenance and installation work to carrying out

their own production, in accordance with the recommended 156 key national products, construction began on a group of plants specializing in electronics. One after another these went into production, and this development raised some pressing standardization needs. In order to deal with the situation, a standards section was set up in 1954 as a part of the former Second Machine Building Industry Ministry's No 10 Technology Office. This was the first instance of standardization work being established in China. During this period, owing to the barriers erected by the capitalist countries, and our own lack of experience, we decided to study the Soviet Union, and a number of urgently needed standards were imported from that country. This was done in order to establish standards for "design management systems" and "technological regulations," an attempt to unify what was basically required for designs and technological documents, drawing methods and methods of management. The imported standards were for "electroplating and chemical paints." Other standards were for data and fasteners, and some for key interchangeable parts. By the end of 1957, the Ministry had issued a total of 140 classes of standards. There were 976 standards in all, among which 556 were for materials. The implementation of these standards was of positive benefit in reforming those features of our electronics industry and technological management which were backward, and in improving the quality of our products.

At the same time it was drawing up and implementing standards, the ministry was organizing a unit to carry out metric system measurements, and progressively unify the weights and measures system of the entire nation's electronics industry; it was promoting the establishment of standardization organizations by industry, in order to develop industrial standardization work; moreover, they started a column especially devoted to standardization in the electronics industry--"Communications on standardization work." The latter was intended to publicize and popularize the work of standardization.

Standardization work for the electronics industry during the Second 5-year Plan was a continuation of following the important models supplied by Soviet products.

## 2. The maturation period (1958-1966)

During the Second 5-year Plan and the 3-year period of adjustment, right along with the transition from copying the Soviet model to creating its own designs, the electronics industry's standardization profession also began to mature rapidly. During the first 2 years of the Second 5-year Plan, owing to the influence of "leftist" thinking, standardization work took a real beating. However, because of the attention paid to it by leadership, the Telecommunications Industry Bureau from 1958 to 1961 held three conferences on standardization work, which were intended to unify knowledge, formulate a program, define the mission and take a positive initiative in developing the work. For this reason, the

overall work can be said to have moved forward during this period. In 1962 the State Council issued "Gongnongye Chanpin Gongcheng Jianshe Jishu Biao zhun Guanli Banfa" [Standards Management Methods for Industrial and Agricultural Products and Engineering Construction Technology], which clarified the general and specific policies, and the mission and system for standardization work. In 1963 the Fourth Machine Building Ministry established the Standardization Research Institute, and before long assigned, within the Science and Technology Commission, specialists with responsibility for managing standardization work. In 1964 the ministry formally made standardization one of the seven articles of the policy regarding development of the electronics industry. In the same year, the ministry issued its "Xin Chanpin Yanjiu, Sheji, Shizhi Gongzuo Tiaoli" [Regulations On the Research, Design and Trial-manufacture of New Products], one section of which was titled, "Standardization Work in the Trial-Manufacture of New Products." These important measures all went a long way in aiding the development of standardization in the electronics industry. Electronic standardization work during this period was characterized by: a rapid increase in the number of personnel with specific standardization duties, along with an improvement in their quality; in standards formulation, a breaking away from the old practice of merely copying foreign standards and a trend to synthesizing a unified, characteristically Chinese method of formulating them. Although the number of standards increased slowly during this period, still the standards produced were more appropriate to China's realities. Attention was given to product seriation: a development of various classes of electronic equipment, and concentration of the many separate classes of electronic components into 22 categories. Moreover, they drew up a serial model register for parts. Every type of standardization work was developed positively, with many forms and dynamic content.

The overall image of this period was one of daily thriving and vitality.

### 3. The standstill period (Fall of 1966 to 1971)

1966 saw the beginning of the "Cultural Revolution's" 10 years of turmoil, during which the standardization profession suffered devastation and destruction. This was especially the case during the years 1967 to 1970, when standardization work was viewed as "revisionism." Under the "Cultural Revolution's" control, blocking and oppression, all was smashed. In a short time, the standards were burned, the system was abolished, the organization was smashed and the personnel were disbanded. This placed the work of the electronic standardization in a totally bogged down condition. A survey of 44 enterprises under the ministry showed that 80 to 90 percent of all their standardization work came to a complete halt, and personnel engaged in standardization work decreased from 300 in 1965 to 40 in 1970.

#### 4. The recovery period (1972 to 1977)

In 1971, the Lin Biao counterrevolutionary clique's conspiracy was smashed, and then from the beginning of 1972, the primary emphasis was on the quality of products and the standards requirements for quality. In that year, the electronics industry held a conference on standards work, which summarized experiences and training, unified knowledge, mediated communications channels and ascertained the mission. It was from this point that electronics industry standardization work began its recovery.

During this time, electronics industry standardization work was still subject to upheaval and damage from the "gang of four;" still, the great mass of S&T personnel on the front lines of standardization stood up to the violent waves, put the disturbances in order and struggled against adversity. In the end they achieved the following: standardization organizations at various levels began to recover and gain strength, and the standardization ranks also developed; "Dianzi Gongye Jishu Biaozhun Guanli Banfa" [Temporary Methods For the Management of Industrial Electronic Technical Standards] was published; all rules and regulations were revised and augmented; and, the "Dianzi Gongye Jishu Biaozhunhua Shinian (1976-1985) Guihua [Ten-year (1976-1985) Plan For Electronic Industry Technical Standardization] was formulated. In keeping with the plan, the organizations as a first step drew up a "Dianzi Gongye Jishu Biaozhun Tixibiao" [Register of Electronic Industry Technical Standards]. They also formulated 1,046 standards. Among these, in conjunction with product quality consolidation, the organizations formulated or revised every class of component standards, taking seriously the development of basic standards and paying attention to their form. Every manner of standardization activity was invigorated, especially that taking place at the prefecture level after the ministry's 1974 notice of recovery. There were more new developments and many kinds of activities, ranging from a general exchange of experiences to formal seminars, with an improved level of activity. So as to make a thorough study of standardization work abroad, from 1973 we began again to participate in the meetings of the International Electrotechnical Commission (IEC). In 1972, "Biaozhunhua Tongxun" [Communications on Standardization] began formal publication, moving forward somewhat in strengthening the publicity aspect of standardization.

#### 5. The development period (1978 to the present)

Since the 3d Plenary Session of the 11th party Central Committee, along with the party's shift in work emphases, standardization work undertook a massive development program. For several years now, the party and the nation have been adopting a series of measures aimed at strengthening standardization work: in 1978 the party Central Committee approved the establishment of the State Standardization Bureau; in 1979 the National

Standardization Conference issued a clear-cut plan, "Strengthen management, conscientiously reorganize, build foundations, develop positively." In the same year, the State Council published the "Zhonghua Renmin Gongheguo Biaozhunhua Guanli Xilie" [PRC Standardization Control Series], in order to provide a new era in development of standardization work. Since 1980, the State Council, the National Defense Industry Office, the former State Machine Building Industry Commission, the State Standardization Bureau and other leading departments held many conferences and issue many directives and stipulations. They required the various concerned departments to strengthen their leadership and conscientiously take charge of standardization work. Since 1982, Premier Zhao Ziyang and other central leading comrades have frequently drawn attention to the need to strengthen standardization work, positively adopt international standards and improve the quality of standards. In 1983, the National Defense Science, Technology and Industry Commission convened the First Military Standardization Work Conference, which was wholly devoted to standardization work in the armed forces. A part of this enlarged activity was aimed at assimilating the useful experiences of standardization work abroad. The work of developing authentication of component quality was intended to improve the components' quality and their ability to compete in the international market. In brief, standardization work during this period was very dynamic: according to 1980 statistics, there were in that year alone 238 meetings on electronic industry standards which were held under the auspices of the Ministry of Electronics Industry's Standardization Research Institute, for an average of eight simultaneous meetings every day. In the last 2 years, standardization activity has increased, and according to preliminary statistics for the second quarter of this year, the total number of people who have taken part in standardization meetings has already reached 6,337. Moreover, this figure does not include those attending the meetings from the sponsoring units. Furthermore, the quantity of standards formulated this year has also done a great deal to further the development of electronic industry standardization work.

During this period, electronic industry standardization work has been chiefly characterized by increased building of standardization organizations. Since 1978, 58 special interest groups and 4 technological commissions have organized, to mobilize the first line of research, production and applications specialists taking part in standardization work. In the formulation of standards, the emphasis is on scientific experience and adoption of such advanced technology as electronic computer technology and mathematical statistics, in order to improve the scientific nature of standards. Serious research, complemented by the positive adoption of international and advanced foreign standards, will raise the level of our standards. Year after year there has been an increase both in the number of projects for formulating standards and in the proportion of basic standards; this will increase the unification of standards throughout the entire nation, and improve their

form. Along with China's opening up to foreign nations, we have sought out even more opportunities for increasing our participation in a wide range of international standardization activity. In the 3-year period 1981 to 1983, there was a total of 1,063 standards formulated, an average of more than 300 per year. These figures demonstrate that electronic industry standardization work is right now in a developmental period.

To sum up the aforementioned several periods, the principle achievements of the past 35 years work in electronics industry standardization work has been as follows:

1. Our system of standardization work is still in its preliminary form. This is mainly demonstrated by the fact that preliminary standardization work management organizations have been established at all levels, and the ministry has set up a standardization management office. This office will be responsible for managing standardization work throughout the ministry: for specialized departments (businesses) which lack a standardization office or organization, they will assume responsibility for developing those departments' specialized standardization work; for each provincial or municipal industrial department which lacks a standardization organization, they will assume responsibility for developing that area's standardization work; for each grass roots plant which lacks a standardization section or office, they will assume responsibility for managing that unit's standardization work. For standardization research organizations, the Standardization Research Institute has supplied the original model, with an S&T staff of more than 240, a relatively high quality research contingent. Since 1978, one after another a group of specialized standardization organizations has been established, and to date there have been four specialized technological commissions established which specialize in such topics as electronic computers. There are 58 special interest groups which have been set up; of these, 2 deal with fundamental matters, 15 with matters relating to components, 8 with matters relating to devices, 32 with installational concerns and 1 with printing and plate making. Because of this, from higher to lower a preliminary standardization work net has been formed.

At the same time that these various kinds of standardization organizations were being formed, a specialized standardization contingent was being put together. Statistics from the end of 1983 show that there were 622 personnel specializing in standardization in the enterprises and research units which are part of the ministry, an average of 5.2 people per unit, with 26 the largest number for a single unit. If we add up all the full time standardization personnel in the ministry, departments, provincial and municipal electronics sections, standardization research institutes, the total comes to nearly 1,200 people. Since this total is based on statistics from fewer than half of the electronics departments' enterprises, the actual total is far greater than that.

In addition to this specialized contingent, there are other personnel scattered throughout the various specialized industrial plants, research institutes and institutions of higher education; these are people skilled in standardization, with a grasp of its specialized knowledge, who have enthusiastically assumed part time standardization responsibilities. This is another numerically strong standardization force.

Table 2 lists for the past several years a survey of the increase in effective standards issued by the Ministry of Electronics Industry for use both nationally and throughout the ministry: by the end of 1983, the total number of such standards was 2,784.

Table 2 also shows that national standards are increasing at a much faster pace than are ministerial standards. Moreover, every year a batch of these ministerial standards are upgraded to the status of national standards, so the actual rate of increase of the latter is even faster. This highlights the trend for standards from the ministry to become national standards.

Again, Table 2 illustrates that the number of national standards has been increasing annually, and since 1980 there has been an annual decrease in the number of ministry standards. By 1983, the number of national standards produced had approached that of ministry standards, and in 1984 far surpassed them. Based on the general cycle of standards formulation, it can be predicted that starting in 1986, the number of national standards formulated and revised each year will definitely be greater than the ministry standards.

The form of the standards has also shown considerable improvement. By the end of 1983, basic and method standards were in general approaching the level of product standards.

Among the standards, the proportion of international standards has obviously increased in recent years. According to the most recent rough statistics concerning 2,851 standards, 304 were national standards. Of these, 2 were international standards which had been adopted with no changes, 144 were equivalents of international standards, and 98 referred to them. Among the 2,547 ministry standards, 4 were exact copies of international standards, 22 were equivalents and 988 referred to or consulted international standards. The total use rate will possibly surpass the statistics for the start of the year by 22 percent. In these standards, there were 94 which individually received national awards for standards excellence, the National Defense Science, Technology and Industry award for notable improvements in science and technology, and the ministry's award for S&T achievements. Some of the standards have attained the international level for standards. Some received gold and silver medals for advancing the production of standards.



TABLE 1: Total of Standards Produced or Revised for Different Time Periods and Average Per Year

Time Period	1954-61 (8 yrs)	1962-63 (2 yrs)	1964-66 (3 yrs)	1967-71 (5 yrs)	1972-80 (9 yrs)	1981-83 (3 yrs)	
Total and Annual Average	717 89.6	6 3	345 115	9 1.8	1497 166.3	1076 358.6	

TABLE 2: Annual Increase in Standards Currently in Effect

Type of Standard	Time Period						
	1978	1979	1980	1981	1982	1983	
Total Number	1743	1768	1970	2287	2446	2784	
National	10	13	28	107	198	267	
Military	--	--	--	--	13	13	
Ministerial	1733	1755	1942	2180	2435	2504	

The realm of standardization has expanded steadily. In recent years, in addition to the steady increase in depth of standardization in original areas, standardization is moving into such new fields as integrated circuitry, electronic computers, photoelectron tubes, sensor components and devices, quality control, reliability, packaging, construction, safety and electromagnetic capacitance.

3. Electronic component quality validation work is in the midst of a flourishing period.

The system of quality validation is an advanced system of quality control, of benefit in raising the level of quality control in the electronics industry and thereby improving the quality of electronic components. The quality validation process enables the producer to enhance the product's reputation, and assures the consumer that the "components conform to standards" and so economize on duplicate testing. This is especially so after the product has gone through international validation, which is of major usefulness in boosting the prestige of China's electronics components in the international marketplace and increasing our foreign exports. In April 1981 China formally established the "China Electronic Component Quality Validation Commission," charged with developing our domestic quality validation work for electronic components.

In 1983, validation resulted in the award of separate national gold medals to the No 715 Plant's CC 1, and the No 742 Plant-Shijiazhuang No 2 Radio Plant's 3DG 130. There are currently another group of products being validated.

On 25 April 1981, the International Electrotechnical Commission's Committee on Electronic Component Quality Control (CMC) formally admitted the "China Electronic Component Quality Validation Commission" to formal membership. Since then, we have been sending delegations to participate in the CMC's various activities. At present we are creating the conditions for China's electronic components to go through international quality validation at an early date.

4. China is enthusiastically participating in international standardization activities, and thereby absorbing the beneficial experiences of international standardization work.

Since 1957, when the International Electrotechnical Commission (IEC) admitted China as a member, our ministry has been sending specialists as delegation members to the annual meetings of the IEC (this was suspended during the "Cultural Revolution"). In addition, China has worked positively towards the development of electronic aspects of the IEC's Technological Committee (TC) special interest group on management. In 1978, after the International Organization for Standardization (ISO) admitted China to membership, our ministry in

accordance with the national division of labor was put in charge of special interest sections TC 95, office machines, and TC 97, computers and information management (these two sections have since been combined into a new TC 97). To date, our ministry has been in charge of 18 technological committees of IEC special interest sections and 34 subcommittees; this is in addition to the IEC's TC 97 information management special interest section and its 34 subcommittees. Moreover, it has completely developed the work of analytical research in these areas.

Since 1978, in accordance with China's policy of opening up to foreign countries, we began giving even closer attention to international standardization work, and particularly to participation in the annual meetings. We also began sending representatives to participate in certain other activities of important technological commissions. During the period 1978 to 1983, our ministry dispatched a total of 59 delegations (groups), with a total of 146 individuals, to take part in the activities of the IEC and ISO's 103 technological committees and subcommittees.

Besides participating in the activities of the IEC and ISO, our ministry also sends delegations to inspect the electronic standardization work of industrially-developed nations. In March 1980 and November 1982, delegations were sent to inspect the standardization work of the United States and Great Britain, respectively. The objectives of these visits were to reach an understanding of the methods and experiences of others in developing electronic technology standards, to establish relations with counterpart organizations, to form friendships, and to obtain valuable data. During May and June of this year, our ministry also sent a delegation to Japan to inspect packing technology and standardization in that country. All these trips obtained beneficial results.

Participation in international standardization work has advanced our domestic standardization work, raised the level of our standards, formed friendships, established extensive relationships with technical professions, opened a window to the study of advanced foreign technology, and has also expanded China's influence.

##### 5. Industrial standardization work has developed greatly.

In the past 35 years, right along with the development of the electronics industry, industrial standardization work has developed greatly. During the 1950's, in the period when industrial standardization was being established, the major work was implementing such high level standards as a design management system and setting up various kinds of standardization rules and regulations. At the start of the 1960's, along with the electronics industry's trend to making its own designs, the emphasis of industrial standardization work was also on a progressive

change of direction to product standardization, generalization and seriation, especially standardization work that grew out of the process of trial-manufacture of new products. This was done to cut down on non-essential varieties and shorten the trial-manufacture period for new products. As time went on, this became steadily more thorough, with its scope expanding at a constant rate: from design to accomplished technology; from construction to electronic circuit; from locally-made items to foreign imports; from finished product to working design, special-use equipment and materials--all across the entire spectrum of technological work, standardization work has been developed, and in all these areas there have been obvious successes. Since the end of the last decade, these enterprises have consolidated, so that their standardization work has become steadily more thorough. In the common attainment of fundamental achievements, some enterprises have proven better at basic standardization work, and have progressively integrated their standardization work into their overall quality control effort, making it a part of their consolidation work. At the same time they are doing a good job of technological standardization, they are developing the work of management standards and work standards. In this way, enterprise standardization work is closely integrated with production as well as management and administration, advancing enterprise standardization work to a completely new phase.

In summary, standardization work in the electronics industry over the last 35 years has had some definite successes, and has been a positive factor in the advancement of our electronics industry. There are still, however, a great many problems in the work, and some great disparities: the level of standards is low, with the great majority of standards too few, and incomplete; moreover, standards are being formulated and revised at too slow a pace, with a long production cycle, very inappropriate to the developmental needs of the electronics industry. Electronics is a sector of our industry which is based in new technology, and characterized by rapid development and a rapid rate of product replacement. It permeates every aspect of our national economy and the buildup of our national defense. It is a newly emerging, fiercely competitive industry. It is a basic industry which is providing modernized equipment for the national economy and the buildup of the national defense. Because it has all these special characteristics, it must keep a step ahead of other sectors, maintaining a definite developmental lead. At the meeting early this year of provincial-level electronics industry department heads, it was proposed that China's electronics industry work for the following goal: assuming that the nation adopt the appropriate measures, by the year 2000 the electronics industry's total output should be six times that of 1980 (an average annual increase of 10.9 percent). This will essentially meet the needs of the four modernizations. The major products and production technology at that time should have attained the level the world's advanced industrial nations had at the end of the 1980's or beginning of the 1990's, and some technologies by the year 2000 should have matched the world's level of advancement

at that time. This objective confronts our electronics industry's standardization workers with a glorious and yet most formidable task. We must take our research seriously, adopt all effective measures, and quickly push forward the work of standardization, and thereby make our proper contribution to the development of the electronics industry and the realization of China's modernization.

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MICROPROCESSOR CONTROLLED STORAGE SAMPLING OSCILLOSCOPE

Beijing JISUANJI YANJIU YU FAZHAN [COMPUTER RESEARCH AND DEVELOPMENT] in Chinese No 1, 1984 pp 50-51

[Article by Zhang Guangming [1728 0342 2494] and Chen Yaochi [7115 5069 3069] of the Computing Institute, Chinese Academy of Sciences]

[Text] Abroad, microprocessors are widely used to update electronic instruments and have greatly improved the functions, accuracy and reliability of electronic instruments. This work is also extensively underway in China. In 1979, using a CSQ-7901 storage sampling oscilloscope developed from combining logic, we added a microprocessor to the oscilloscope and developed the CSQ-8001 intelligent instrument. Various problems of how to apply a microprocessor to an oscilloscope were resolved in this instrument and its functions were carried out through software: measuring, digitizing the display and the data processing necessary for imaging. At the same time some peripheral equipment could be added so that the use of the main computer is improved even more. The method of preprogramming functions was used in the CSQ-8001 so that control of the oscilloscope is very handy; "handbook" operation also gives the system expanded functional flexibility; digital automatic synchronous circuits are also stable and reliable; the sampling technology covers a very broad passband (800 MC). The range of application of this oscilloscope is broad (it can be used in computer, petroleum, seismic, medical, scientific research and military departments) and its reliability is high and it is easy to duplicate.

The CSQ-8001 sampling oscilloscope with a microprocessor (as pictured in photo 1) is actually more than an oscilloscope. It can be viewed as a data collector and processing terminal and it can also be used as a control system.

Functions and Characteristics of the CSQ-8001

The CSQ-8001 is made up of a CPU (8085A), 10 interfaces (8212, 8255), random access memory (8K x 8) and read-only memory (3K x 8). It has 13 function keys, each assigned to one operation which can be divided into four types:

(1) Storing wave forms: Wave forms are converted into data quantities and stored in memory pages, each page containing 256 points, if the memory is

4K, it can store 16 different wave forms. The sweep speed, sensitivity, and level can also be stored on the page at the same time as the wave form is stored. That is, the duplicate wave form can be stored and complex encoding pulses can also be stored. Since its bandwidth is 0-800 MC it can store pulses of 0.4 ns. In addition to storing duplicate pulses it can also store single pulses and can also keep in memory pre-contact signals. The above described storage methods can be "frozen" manually or automatically.

(2) Processing: Page transfer (wave forms stored on one page can be transferred to another page in digital form); average storing: stored wave forms can be averaged 256 times and a valid signal can be taken from random noise; arithmetic operations (the contents of two pages can be added, subtracted, multiplied, or divided); plotting (a stored wave form can be sent to a plotter and drawn on paper to be kept on file).

(3) Display: While displaying wave forms from two pages at the same time, characters indicating the time and range are displayed at the top of the screen and in the lower left hand corner is a "zero" current indicator symbol. On the wave form there is a brightness indicator for measurement time and for measurement range cursor callipers which can move left or right on the screen (as illustrated in photo 2a) are used; 8 lines: wave forms from 8 pages can be displayed simultaneously on the screen and the brightness indicator can accurately define the relative position between wave forms (as in photo 2b).

(4) Manual: The user can use the "manual keyboard" to enter a new program into random access memory and the instrument will automatically execute this new program.

#### Characteristics of the CSQ-8001

(1) "Temporary stop," data measurement: Using the "temporary stop" operations, the wave form can be "frozen" on the screen and at this time the probe to be used for input can be separated by observation points. This feature makes it very convenient for the user, for example when there are many points for observation, the point wave forms can be stored on each page one by one and then "frozen" and carefully measured. This will greatly improve efficiency. During measurement, the "brightness" and "callipers" and the digital characters displaying results can eliminate reading errors, and thus improve measurement accuracy and efficiency.

(2) Observing irregular encoding pulses: The CSQ-8001 has automatic synchronous capacity (when the contact frequency is 0-1 (MC) thus it is only necessary for any digital system to give out a characteristic position and the CSQ-8001 can display the irregular encoding pulse distinctly and stably. As the print-wheel of a toggle synchronous system, any position in a string of irregular encoding can be observed. This is very unusual in a regulator computer and digital system.

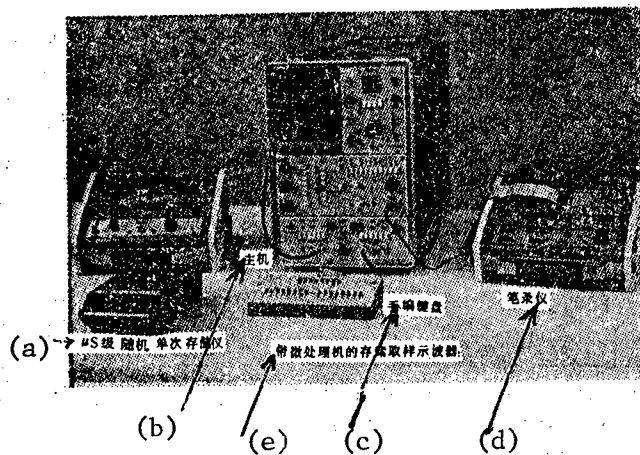
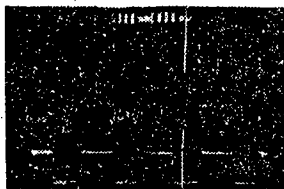


Photo 1.

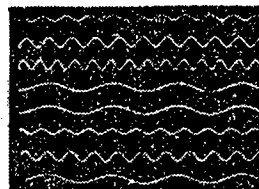
- a. S level random single pulse storage device
- b. Main computer
- c. Manual keyboard
- d. Pen plotter
- e. Microprocessor Controlled Storage Sampling Oscilloscope

Photo 2.

Time Range  
Character Character



Twin Lines



Eight-line  
Display

(3) Elimination of wobble: When high speed pulses which have considerable wobble are displayed on an oscilloscope, they are often rather indistinct, but if the CSQ-8001's "stored average" control is used, these pulses can be displayed distinctly. By the same token, effective signals which have been covered up by random noise can similarly be displayed distinctly.

(4) Observation of single pulses: It is often very difficult to seize one random pulse which appears just once, as in the transitional process after the electric source has been cut off, the transient situation when a weapon system is fired, in an electrocardiogram, and in a seismic wave. Since the CSQ-8001's real-time sampling can observe signals before contact and can automatically seize them, it is very well suited to observing such wave forms and each time such a wave form is seized, it can be duplicated on the screen



without producing any flicker, it makes it easy to observe and measure carefully such fugitive signals and record them on paper, thus eliminating the need for such complex tasks as photography.

(5) Automatic adjustment of quantity: When carrying out graphing operations, if there is any overflow, the quantity can be automatically adjusted so that as the image on the screen changes, the measurement of data also changes correspondingly so that the data read out is still accurate.

(6) Separation of "storage" and "display": Storage of wave forms is synchronous with observing wave forms, but display of wave forms is determined by the program and thus when observing low frequency wave forms there isn't any flicker.

(7) Multiple line display: The CSQ-8001 can display 8 lines simultaneously, thus wave forms of different observation points from the same system or wave forms from different systems or standard wave forms and measured wave forms or past wave forms and present wave forms can all be displayed on the screen at the same time to facilitate analysis and comparison by the user.

#### Summary

1. Programmed functions: The functions of the CSQ-8001 are realized through software and thus the degree of intelligence is rather high. Having the functions programmed also makes the instrument very adaptable.

2. Preprogrammed functions: The programs which execute the functions on the CSQ-8001 all are stored in read-only memory and when programming, attention should be paid to storing the program in read-only memory saving the random access memory for storing images and data. This method greatly improves the reliability of the instrument. In addition, the preprogrammed functions are marked on the function keys on the control panel which makes it very convenient for the user to use this instrument. Although the CSQ-8001 has a microprocessor, even if the user does not understand microprocessors, he still can operate it flexibly.

3. Expanded functions: Preprogrammed functions makes it simple to use but it also has its limitations since there is no way to expand functions spontaneously for this reason there is "manual" operation. This adds great flexibility and makes up for inadequacies in the preprogrammed functions.

4. On the basis of the features of the instrument, using a microprocessor to make up a microcomputer suited for use with an instrument (i.e., single-board computer) is a very economic and rational method.

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CSO: 4008/167

## APPLIED SCIENCES

### IMPROVEMENTS IN TQ-16 COMPUTER DISCUSSED

Dalian DALIAN GONGXUEYUAN XUEBAO [JOURNAL OF DALIAN INSTITUTE OF TECHNOLOGY]  
in Chinese No 4, Dec 83 p 66

[Article by Qiu Jingchun [6726 2529 2504], Dalian Institute of Technology,  
Computing Center: "Some Expansions and Improvements in TQ-16 Microcomputer  
Hardware and Software"]

[Text] The TQ-16 electronic computer is one of the most widely used Chinese manufactured computers in China. Since our institute bought this computer toward the end of 1974 it has served in intramural and extramural research, teaching and production. After the [Institute's] admissions system was revised, this computer served as the main computer for our institute to provide over 10,000 hours of computer time for training university students in our field since 1977, and since 1978 for graduate students and doctoral candidates to write graduation theses and to do scientific research with a computer.

In addition to the normal uses described above, since 1978 we have carried out the following software expansions and necessary technical advances on this computer and thus expanded its functions and improved its rate of use.

1. We implemented FORTRAN. In 1978 our institute first developed FORTRAN for the TQ-16 and held two national conferences to promote it. It has now been adopted by over 50 units and has achieved high economic benefits.
2. We implemented structured FORTRAN. This is now used by over 20 units within China. This language provides the user with a new structured program design tool and has improved editing efficiency.
3. We added F<sub>4</sub> [FORTRAN IV] data input format and data input/output programs. This had the advantages of improving operating speed, reducing data punching and facilitating verification, and was welcomed by users.
4. We developed a digital clock display and its processing program. It provides the user with billing information through both digital display and electronic transmission, thus improving management of the machine and reducing the burden on the computer operator.

5. Other technological improvements are:

- 1) adding an address coincidence circuit;
- 2) improvements in printer shutter[?];
- 3) adding CK-160 high speed [paper tape] perforator;
- 4) improvements in the printer ribbon turnaround device;
- 5) adding externally controlled spacing liukongge [3966 4500 2706] logic to the high speed perforator;
- 6) improvement of the reading head of the photoelectric tape.

Some of the above have already been spread throughout the country, while others are now being promoted and they play a very big role in improving the rate of use of computers manufactured in China.

Participants in this work are:

Chi Zhongxian [6688 1813 0341]  
Zhang Qingmian [1728 3237 4875]  
Wang Xiukun [3769 4423 0981]  
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Wang Xicheng [3769 1585 6134]  
Jian Youliang [4675 1635 5328]  
Yan Changping [7051 7022 1627]  
Li Jixun [2621 1323 6064]  
Zhang Guorui [1728 0948 3843]

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CSO: 4008/167

EXPEDITION GEOLOGISTS PROBE ANTARCTIC SEABED

OWI40623 Beijing XINHUA Domestic Service in Chinese 1712 GMT 12 Feb 85

[Text] Antarctic, 12 Feb (XINHUA)--Geologists with the Chinese Antarctic expedition have successfully gathered valuable geologic samples, data, and deposits of deep ocean ooze from the seabed of the Antarctic Ocean. With these samples, including moraines and cryoconites, on hand, they have begun to understand the features of the subterranean structure in the surveyed area, thereby filling the gap in China's Antarctic geological survey.

Power shovels, box-type sampling packers and large-caliber sampling pipes were used by the Chinese geologists to gather geologic samples from the deep seabed in the Antarctic area's four bays and two straits, reaching some 4,200 meters below sea level on a number of occasions as far south as Adelaide Island, within the Antarctic Circle. Members of the Chinese expedition sailed several thousand nautical miles to survey the gravity, magnetic force, and ocean depths in the Antarctic, and inspect rocks, terrain and glaciers on a number of adjacent islands. They have completed a preliminary analysis of the characteristics of the subterranean and geological structures of the bays, the continental shelf, slopes, and seabed in the areas they have surveyed.

Experts pointed out that the Antarctic continental shelf is so narrow that it generally extends only a few score kilometers, while the maximum width of the East China Sea's continental shelf is more than 600 kilometers. The sea depth in the areas connecting the Antarctic continental shelf with the continental slope is somewhere between 400 and 500 meters, deeper than that of any other similar area. The Antarctic continental shelf is not as flat as other continental shelves for it reaches to within 100 meters of the surface in quite a number of locations. Ladder-shaped crevasses in the Antarctic continental shelf were detected by the echo-sounders in the Chinese surveying ship, indicating subsidence breaks, resulting from movements of the earth's crust. Among the deposits of ocean ooze gathered from the Antarctic Ocean's seabed are gravel, sand and diamond-shaped slabs. Even the surface of the deposits of deep ocean ooze gathered from locations far from shore contain some sands. These particles came from the land and islands, and are signs of glaciation and glacial outwash. Odds and ends, debris and other particles from the land can be washed to the seabed at a depth of more than 1,500 meters. Experts believe that the primary motive force behind the formation of deposits of ocean ooze in the Antarctic was the calving of icebergs, floes, and glaciers,

as well as snowstorms and strong winds which blend material substances from the land into the sea. The existence of contemporary benthos on the seabed of the Antarctic Ocean is obvious; holes and other signs of the activities of benthos can be seen on the surface of deposits of ocean ooze gathered from the seabed.

On their way to the Antarctic, members of the Chinese expedition on board the exploration ship surveyed the gravity, magnetic force, and sea depth for more than 700 nautical miles. The abnormality of the magnetic tapes with date recorded on them indicates the forming of a new earth crust resulting from the expansion of the seabed.

CSO: 4008/220

APPLIED SCIENCES

ANTARCTIC SURVEY TEAM LAYS MEMORIAL STONE

OWO80957 Beijing XINHUA Domestic Service in Chinese 1649 GMT 6 Feb 85

[By reporter Qiu Weimin]

[Text] King George Island, 5 February (XINHUA)--On the eve of the completion of China's Changcheng Antarctic Station, a stone tablet and an iron anchor, marking the meritorious service of China's first Antarctic survey team and the Navy of the People's Liberation Army in establishing China's Changcheng Antarctic Station, were laid each side of the national flagstaff in front of the major construction site of Changcheng Station.

The stone tablet on the right is 80 cm wide, 1.3 meters high, and weighs 300 kilograms. It is inscribed with three big characters "Chang Cheng Zhan" [7022 1004 4541, Great Wall Station] and a line of small characters reading "China's first survey team to Antarctica." The big iron anchor on the left weighs 1.5 tons, and is typecast with 22 big characters which read "In memory of the first Antarctic trip by 308 naval officers and sailors of the Chinese People's Liberation Army." Granite from Qingdao's Laoshan was also laid today at the summit of a mountain west of the Changcheng Station.

CSO: 4008/220

APPLIED SCIENCES

NEWSLETTER ON ANTARCTICA, BEIJING COMMUNICATIONS

OW150933 Beijing XINHUA Domestic Service in Chinese 1511 GMT 14 Feb 85

["Newsletter" by XINHUA reporter Zhu Youdi "Calls From Antarctica to Beijing"--XINHUA headline]

[Excerpts] George Island, Antarctica, 12 Feb (XINHUA)--A silver white cylindrical antenna with a round top stands aloft on the top deck of "Xiangyanghong 10." It never stops revolving even amid roaring waves on the Antarctic Ocean or on icebergs in the waterlanes of the Antarctic peninsula, continuously catching the sounds from Beijing and transmitting news of the Chinese scientific expedition team members from the southernmost area of the earth to the people of the motherland.

Due to strong magnetic interference in the polar region, the Chinese Antarctic survey ship encountered serious difficulty in the transmitting time and frequencies of short-wave communications after it entered the antarctic circle. Since it entered the Antarctic peninsula area, "Xiangyanghong 10" has maintained its communications with the motherland and other countries through the Mariner satellite over the Atlantic Ocean. The staff members in the Mariner satellite communication room have been working as hard as other expedition team members day and night.

On spite of a heavy work schedule during the Antarctic expedition, all comrades of the communications room have worked conscientiously during their duty hours while concentrating efforts on diligently studying the theory and operational techniques of the satellite communications in off-duty hours.

Departments concerned will hold a spring festival tea party for the families of the expedition team members in Beijing on 15 February. At that time, 11 team members will be able to directly speak to their families tens of thousands of miles away via telephone.

CSO: 4008/246

## APPLIED SCIENCES

### SCIENTIST STUDIES MAGNETIC WAVES IN ANTARCTIC

OW160639 Beijing XINHUA Domestic Service in Chinese 1504 GMT 15 Feb 85

[Text] King, George Island, 14 Feb (XINHUA)--After strenuous effort, He Changming, a 28-year-old scientist and member of the scientific survey subgroup of the Chinese Antarctic survey team, has successfully received the electromagnetic waves generated by the particle flow from the sun passing through the sky of the polar area with a "GM-MODEL [expansion unknown] fixed-direction received for receiving whistling" developed by China at the China Antarctic Changcheng Station on King George Island in the Antarctic. Such magnetic waves are generally called whistling.

Today, in the small tent where He Changming works, the reporter heard the melodious sounds from the outer space. He Changming, who is a 1983 alumnus of the graduate school of the Chinese Academy of Sciences, specializes in geomagnetism and high-altitude physics. He told the reporter that he has recorded more than 40 hours of the whistling and very low frequency emissions since he first received the whistling of 0200 on 17 January in the Antarctic.

Stratospheric atmospheric physics is a science that studies the effects of the sun's activities on the earth. In other words, it studies the relations between the sun and the earth. The whistling received at the Changcheng Station can be used as a tool and means for checking high-altitude physical environments. The antarctic is an area where the sun's activities can be discovered and captured sooner. It is a window through which people may observe the universe. Therefore, it is of special significance to study high-altitude physical phenomena in the Antarctic. He Changming's achievement has filled an important blank in China's sophisticated scientific research in the Antarctic and has created wide prospects for China to conduct stratospheric physical studies there.

CSO: 4008/246



APPLIED SCIENCES

STATE COUNCIL MESSAGE GREETS ANTARCTIC TEAM

OW191437 Beijing XINHUA Domestic Service in Chinese 0918 GMT 19 Feb 85

[Text] Beijing, 19 Feb (XINHUA)--The State Council today sent a congratulatory message to all comrades of the Chinese Antarctica Scientific Research Team to greet the completion of the Chinese Great Wall Station in Antarctica. The message reads as follows:

To all comrades of the Chinese Antarctica Scientific Research Team:

The building of China's first Antarctic scientific research base--the Chinese Great Wall Station in Antarctica--has been successfully completed in days when the people of the whole country are happily celebrating the Spring Festival. The State Council wishes to extend its warmest greetings and regards to all comrades taking part in scientific research in Antarctica.

The completion of the Chinese Great Wall Station in Antarctica has filled a gap in our country's scientific research work. It marks a new phase in our country's studies of the polar regions and has also laid a foundation for further strengthening international scientific and technical exchanges and cooperation and peaceful utilization of the Antarctica in the interest of mankind.

The completion of the station was of great importance to further strengthening research in geophysics, oceanography, meteorology, telecommunication technology, and space science as well as to the country's socialist construction.

It is hoped that you will struggle in unity, overcome difficulties, continue your efforts, and make greater contributions to the peaceful utilization of Antarctica by mankind.

The State Council

19 February 1985

CSO: 4008/246

APPLIED SCIENCES

PRC ANTARCTIC TEAM CONCLUDES SURVEY VOYAGE

OW152356 Beijing XINHUA Domestic Service in Chinese 1535 GMT 13 Feb 85

[Text] Aboard Chinese Antarctic Survey Vessel "Xiangyanghong No 10," 13 Feb (XINHUA)--China's scientific survey vessel "Xiangyanghong No 10" participating in the survey of the Antarctic has successfully concluded its survey of the Antarctic Ocean and victoriously returned to the Mingfang anchorage of King George Island.

Its survey was conducted in two stages, and the vessel surveyed four sea areas of the Antarctic Ocean--the sea of krills, the Antarctic Circle sea areas, the continental shelf sea areas of the South Shetland Islands, and the Bransfield Strait Sea area. It conducted a long-distance geophysical survey of the northern part of the Antarctic Peninsula and investigated three bays of the South Shetland Islands. It sailed close to the Antarctic Peninsula, set up an observation post some 6 nautical miles from the peninsula, and sent 36 persons to make an on-the-spot survey of Cape (Lakeloose) of the Antarctic Continent. A quantity of major data and specimens of scientific value were collected.

The team encountered cyclone storms on many occasions throughout its survey trip. The strongest wind force was of grade-12 and above. All the survey team and crew members fought tenaciously against them and sailed out of danger on all those occasions.

CSO: 4008/246

## APPLIED SCIENCES

### PROFESSIONAL COMMITTEE ON SOLID PROPULSION HOLDS CONFERENCE

Beijing YUHANG XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS] in Chinese  
No 2, 30 Apr 84 p 91

[Excerpt] On 2 November 1983, the Professional Committee on Solid Propulsion of the Chinese Society of Astronautics held an academic exchange conference in Huzhou City, Zhejiang Province. Attending the conference were 64 representatives of 28 organizations including academies, colleges and universities, research institutes and plants. Chairing the meeting were Professors Tang Xinyi [3282 1800 7328] and Zhu Hesun [2612 7729 5549].

To better run the conference, a leadership group and a review committee for academic papers were organized. The conference marked the second such academic exchange event for the Professional Committee on Solid Propulsion to be held since the meeting in Changsha in 1982.

Altogether, some 45 academic papers and technical reports were received at the conference. Of these, 20 were presented at the conference itself while the remaining 25 were used for academic exchange at the group sessions. Delegates at the conference carried out serious and enthusiastic discussions of the papers and technical reports that were exchanged, using them for mutual study and enhancement. Following the exchange conference, the articles were given a democratic appraisal and nine of the better ones were selected and recommended for publication in YUHANG XUEBAO or in other domestic and foreign periodicals.

CSO: 4008/238

LARGE-AREA BERYLLIUM WINDOW FOR ASTRONOMICAL SATELLITE PROPORTIONAL COUNTER DEVELOPED

Beijing HEDIANZIXUE YU TANCE JISHU [NUCLEAR ELECTRONICS AND DETECTION TECHNOLOGY] in Chinese Vol 4, No 6 Sep 84 pp 358-361

[Article by Zhang Yujiang [1728 3768 3068] and Du Lancun [2629 5695 1317]: "Astronomical Satellite Proportional Counter with Large-Area Beryllium Window"]

[Text] This article describes the structure, technical features and performance of the ZJ-1113 beryllium window proportional counter with a thickness of 0.1 mm and an active area of 81 cm<sup>2</sup>. The counter has a high energy resolution, wide linear range, high detection efficiency and a long lifetime.

The model ZJ-1113 large-area beryllium window proportional counter was developed for the astronomical satellite launched by China. It is used mainly for the detection of low energy cosmic X-ray. With advanced space technology, a brand new class of space objects -- the X-ray sources -- were discovered. The X-ray sources in space has enriched the understanding of the universe and observation with X-ray has become an important branch of astronomy. Since the atmosphere does not transmit X-ray, the experiments must be conducted outside the atmosphere and the beryllium window proportional counter is a powerful tool in the study of X-ray astronomy.

The large area beryllium proportional counter has a closed structure and functions reliably. Its energy resolving power is high and its range of linear response is wide. The construction is rugged and the service life is long in an adverse environment. It is suited for measuring lower energy X-ray and  $\gamma$ -ray.

#### I. Construction Features

The construction of the large-area beryllium window proportional counter is shown in Fig 1. It is made of stainless steel and has the shape of a parallelepiped with one side surface covered by the beryllium window. To ensure that the photoelectrons are thoroughly absorbed by the gas medium, to reduce the side wall effect and to increase the detection efficiency, the depth and the width of the detector are made equal. The dimensions

are  $44 \times 44 \text{ mm}^2$  and the effective sensitive length is 355 mm. In order to reduce the interference of the energy spectrum to be measured by the tube wall fluorescence, the other shell should be made of beryllium, magnesium or aluminum. Since the costs for beryllium and magnesium tubes are too high and the seal of the aluminum tube cannot be guaranteed, we made the outer shell out of stainless steel and the inner liner out of aluminum. The center anode is made of  $50 \mu\text{m}$  rhenium-tungsten wire or gold plated tungsten wire and the two ends of the electrode are fixed in position and insulated ceramics. The window is made of  $100 \mu\text{m}$  beryllium film, the area is  $120 \text{ cm}^2$  and the effective area is  $81 \text{ cm}^2$ . The grid provides some strength to protect the beryllium film.

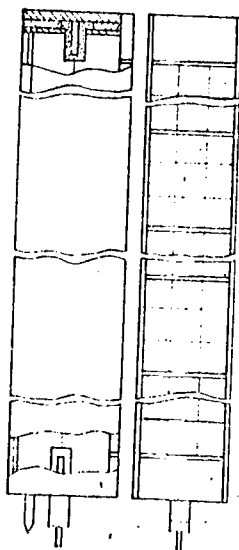


Fig 1 Construction of the proportional counter

## II. Technical Features

The window of the proportional counter is sealed by the beryllium film. Organic glue was first tried to seal the beryllium window to the window frame. Tubes made with this method have a short shelf life because the organic glue outgasses and is permeable to water moisture. The counter performance deteriorates quickly. We therefore joined the treated beryllium window to the stainless steel to form the vacuum seal and overcame the difficulty of sealing large and thin beryllium window. The technique worked satisfactorily.

The working medium is argon gas, the quench gas is  $\text{CO}_2$  (because its counting life is two orders of magnitude higher than that of methane) and a small amount of helium gas is used as a tracer. The gas pressure in the tube is 940 mm Hg and the gas composition is Ar (90%) +  $\text{CO}_2$  (9.5%) + He (0.5%).

### III. Major Specifications

#### 1. Energy spectrum and resolution

The energy resolving power is an important parameter of the X-ray proportional counter. It depends on the energy of the incident X-ray, the structure of the counter, the type of gas and the operating condition of the tube. For a given counter, the resolution depends mainly on the statistical fluctuation of the number of ion pairs and the magnification of the gas. Theoretically, the energy resolution of a cylindrical counter may reach 14 percent for a 5.9 keV  $^{55}\text{Fe}$  source. The actual measured energy resolution of the large-area beryllium window proportional counter is 17 percent for a  $^{55}\text{Fe}$  source and 11.5 percent for a 13.5 keV  $^{238}\text{Pu}$  source. Figure 2 shows the energy spectrum. The main reasons that the measured resolution is lower than the theoretical value are: (1) insufficient purity of the gas medium, (2) lack of cleanliness and smoothness of the inner surface, (3) lack of surface uniformity and surface contamination of the anode wire and displacement of the center wire, (4) shape of the counter tube and the grid structure of the beryllium window, and (5) factors ignored by the theoretical calculation.

The energy resolution of the large-area beryllium window proportional counter, like other X-ray proportional counters, depends on the voltage. Figure 3 shows the change of the energy resolution with the operating voltage.

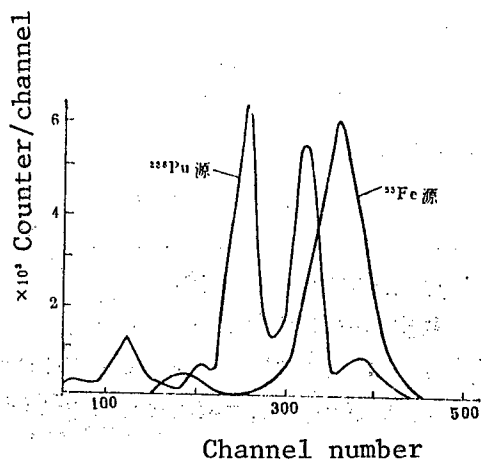


Fig 2 Energy Spectral curve

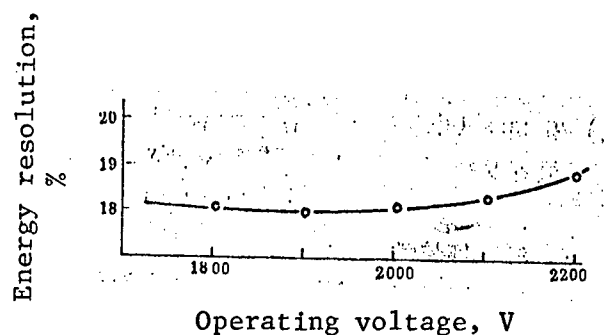


Fig 3 Energy resolution as a function of the operating voltage

## 2. Linearity of the energy curve

The large-area beryllium window proportional counter is used mainly in the detection of 2-20 keV cosmic X-ray. In this energy range it has good linearity. Using  $^{55}\text{Fe}$  and  $^{238}\text{Pu}$  sources, we measured the linearity of the energy curve at a given operating voltage, see Fig 4.

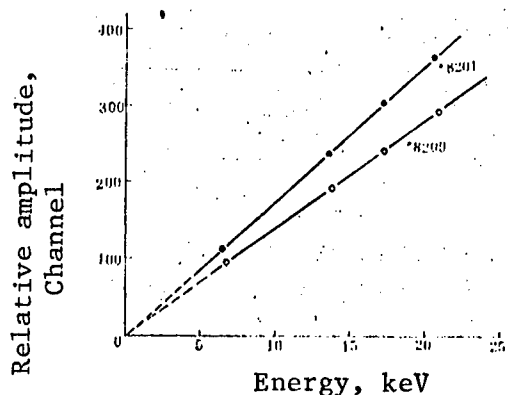


Fig 4 Linearity of the energy curve

## 3. Counting characteristics

The counter characteristics curve is given in Fig 5. As can be seen, when the counting rate reaches or exceeds  $1 \times 10^4$  cps, the output amplitude begins to drop and the energy resolution becomes worse. There are two reasons for this behavior: (1) Effects of the space charge. At a high counting rate of  $10^4$  cps, the gas produces large number of ions. The ions accumulate in the vicinity of the anode and weaken the electric field and hence reduce the magnification of the gas. (2) Overload of the amplifier. Therefore, in order for the energy resolution of the large-area beryllium window proportional counter to be better than 20 percent, the maximum counting rate should not exceed  $1 \times 10^4$  cps.

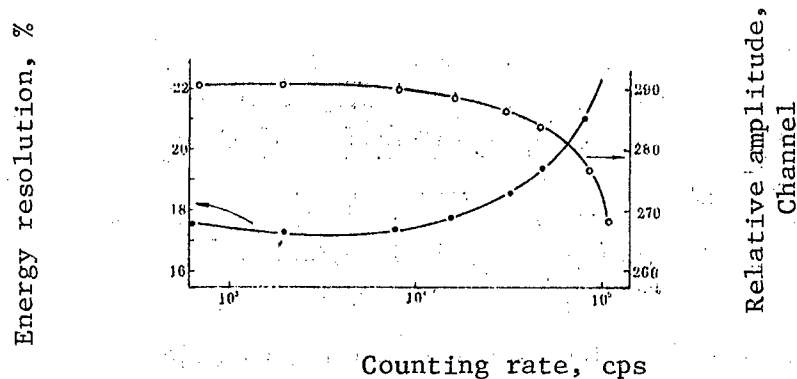


Fig 5 Counting characteristics curve

#### 4. Gas magnification

Figure 6 shows the gas magnification. As can be seen, the gas magnification of two counters are not identical but they are both linear. The cause of the discrepancy is the difference in gas pressure.

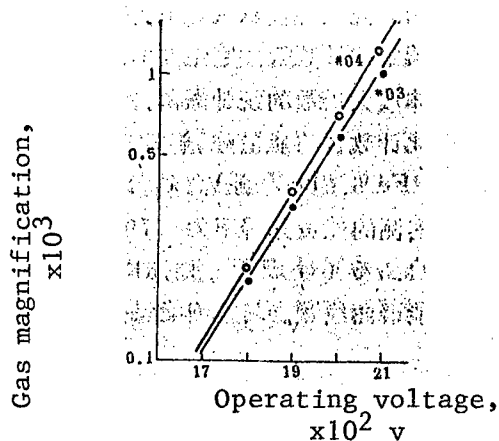


Fig 6 Gas magnification

#### 5. Output pulse rise time

By illuminating the large-area beryllium window proportional counter with <sup>55</sup>Fe and <sup>204</sup>Tl sources, we measured the X-ray and electron output pulse rise time. The measured results show that output pulse rise time differ considerably for the two radiations. At 0.7 V<sub>max</sub>, the rise times are 0.4 μs for x-ray and 1.6 μs for electrons. At 0.9 V<sub>max</sub>, the rise times



are  $0.7 \mu s$  for X-ray and  $3 \mu s$  for electrons. Here  $V_{max}$  is the maximum output pulse. Therefore, the X-ray and the high energy electrons in space can be easily distinguished.

## 6. Plateau characteristics

Figure 7 shows the plateau characteristics of the large-area beryllium window proportional counter measured with a  $^{55}Fe$  source. As can be seen, the plateau length is about 300 V and the slope per 100 V is less than 1 percent.

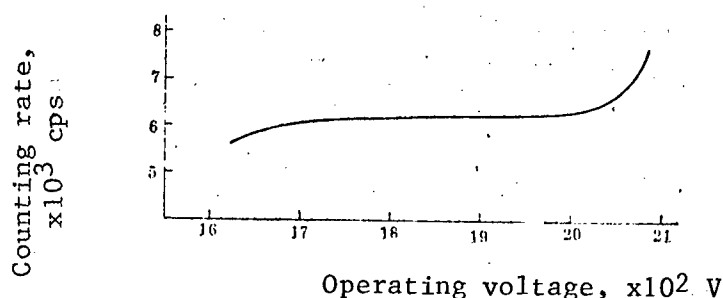


Fig 7 Plateau characteristics of the counter

## IV. Conclusions

We have developed and studied the ZJ-1113 large-area beryllium window proportional counter for the use in astronomical satellites. The major technical specifications of this tube have reached the level of similar foreign units.

After extensive testing and application, the counter has proved to be rugged and easy to use. In addition to the ZJ-1113 for astronomical satellites, we have also developed ZJ-1113-2 and ZJ-1113-3 for the detection of low energy  $\gamma$ -ray and X-ray.

Xiao Gongshan [5135 0501 3790], Xuan Zhaoxiang [1357 5128 4382], Liu Guimei [0491 2710 2734], Yang Junxiang [2799 0193 4382], Gao Chun [7559 2504], and Liu Wenlan [0491 2429 5695] have participated in the development of the large-area beryllium window proportional counter.

9698

CSO: 4008/180

## APPLIED SCIENCES

### HAIKOV ELECTRONICS INDUSTRY DEVELOPS

HK091024 Beijing ZHONGGUO XINWEN SHE in Chinese 0330 GMT 9 Jan 85

[Report: "Haikou's Electronics Industry Becomes One of Hainan's Major Industries"]

[Text] Guangzhou, 9 Jan (ZHONGGUO XINWEN SHE)--Haikou's electronics industry now has become one of Hainan's six major industries. Its total output value in 1984 leaped to fifth place in the province.

In the last 2 years Haikou's electronics trade and some units of other industries have fully utilized the special and preferential policies granted by the state to Hainan and have made use of foreign investment, equipment and technology to build up the local electronics industry. Since the end of last year, the Hainan Electronics Industrial Company imported six electronics production lines, including the installation of production lines for black and white and color television sets, and introduced advanced production and management technologies, enabling the yearly output value to exceed 90 million yuan.

Prior to 1983, Haikou could only manufacture some simple electronics products and its output value lagged behind the whole province. Now there is a great variety of products manufactured by Haikou's electronics trade, which include various brands of black and white and color television sets, stereo recorders, video recorders, microcomputers, and so on. These products are marketed throughout the country.

CSO: 4010/97

## APPLIED SCIENCES

### TECHNICAL FAIRS SPREAD KNOW-HOW, RESEARCH

OW162007 Beijing XINHUA in English 1511 GMT 16 Jan 85

[Text] People looking for technical know-how or having a new research result to sell can come to a new type of fair in China, which serves as their "go-between."

Sponsored by government institutions, enterprises or individuals, such fairs can spread technology at the quickest possible rate.

It was hard to get research findings applied to production in the past for lack of a rendezvous point.

Now people can sign contracts for technology transfer or technical assistance at such fairs at prices agreeable to the two parties involved.

At one technical fair in Wuhan, central China, 410 contracts were signed. Upon fulfillment, they are expected to generate 15 million yuan's worth of value.

A similar fair in Shanghai involving 500 enterprises in 13 industries made it possible for most of the 2,200 technologies offered to be transferred to production.

The Ministry of Ordnance Industry sold 500 items of technology at one fair. Similar fairs in Shanghai, Jiangsu and Tianjin helped expand local industries.

One new process for synthesizing an inorganic salt developed by the Hubei Institute of Chemistry has helped a Wuhan chemical works turn from losing money to making profits.

It is now producing 2.5 million yuan's worth of goods annually with a new profit of over 200,000 yuan.

CSO: 4010/96

## APPLIED SCIENCES

### INTERNATIONAL MACHINERY TECHNOLOGY FAIR OPENS

OW081243 Beijing XINHUA Domestic Service in Chinese 1421 GMT 6 Dec 85

[By Reporter Yang Jigang]

[Text] Beijing, 6 Dec (XINHUA)--The China International Machine-Building Technology Trade Fair jointly sponsored by the China National Machinery and Equipment Import and Export Corp and China Automotive Import and Export Corp opened in Beijing today.

Attending the trade fair were representatives of Chinese enterprises and departments concerned as well as some 250 businessmen from Austria, Australia, Belgium, Canada, France, the FRG, Italy, Japan, Sweden, Switzerland, Singapore, Britain, the United States, and Hong Kong.

It was revealed that during the fair the Chinese and foreign businessmen will discuss a Chinese plan to import 80 machine-building technological items. Agreement is expected to be reached on some of the items.

Zhou Jinnan, minister of Machine-building Industry; and Wang Ziyi, chairman of the board of directors of the China National Machinery Import and Export Corp, attended today's opening ceremony.

Since 1978, Chinese machine-building industrial departments have signed more than 310 license and other kinds of scientific and technological cooperation agreements or contracts with business ventures of a number of countries and regions. Various provinces, municipalities and autonomous regions have also concluded many agreements in this field. This has made China's machine-building industry a leading department in the number and substance of technological imports.

In his opening speech, Wang Ziyi said: We have established good cooperative and trading relations with many well known, large international corporations. There are many small and medium-sized enterprises in the world that specialize in a particular technology suitable to our needs. We are willing to strengthen our contact with them.

CSO: 4010/96

## APPLIED SCIENCES

### PRC'S MACHINEBUILDING INDUSTRY TO BE UPDATED

HK210419 Beijing CHINA DAILY in English 21 Nov 84 p 1

[By staff reporter Chen Guanfeng]

[Text] China's machine-building industry is being brought up to date with the aim of doubling output and profits by 1990, CHINA DAILY was told yesterday.

The emphasis in the Seventh Five-Year Plan (1986-1990) will be on improving quality, increasing variety and raising economic efficiency.

The Ministry of Machine-Building Industry's first step will be to set up quality control systems in all state-owned factories by 1987 and set up 60 model enterprises in quality control.

From 1986 to 1990, the ministry plans to scrap 5,000 obsolete products and introduce 15,000 new varieties, so that by 1990 more than 60 percent of its products will reach the standards of those produced in developed countries in the late 1970's or early 1980's.

Technical imports will be used to help achieve the goal. A recent ministry report said 1,000 technical items will be imported from 1986 to 1990.

Cooperation with foreign countries will be encouraged in design and production, more foreign funds will be used, and product design, equipment design and equipment manufacturing corporations will be launched with foreign firms.

Foreign experts will also help in design, consulting and manufacture.

The ministry will set up a new standards system in all machine-building enterprises and bring in more than 10,000 state and professional standards.

About 100 product inspection centres will be set up across the country, so that more than 75 percent of the country's machinery products can be checked against international standards.

To encourage enterprises to develop new products, the ministry will give these enterprises preferential terms in the allocation of technical development funds, loans and taxation.

New technologies such as micro-electronics and micro-computers will also be applied to production, research, design, management and information.

The ministry has already made progress in promoting technical advancement of its enterprises through technical imports. From 1978 to 1983, it signed 275 contracts with foreign countries involving \$325 million, and launched 36 projects in joint venture, co-production and production according to foreign designs.

CSO: 4010/96

APPLIED SCIENCES

MACHINEBUILDING INDUSTRY TO STRESS POWER EQUIPMENT

HK280422 Beijing CHINA DAILY in English 28 Oct 84 p 1

[By staff reporter Chen Guanfeng]

[Text] The machine-building industry will make production of electric power equipment a top priority under the Seventh Five-Year Plan, CHINA DAILY learned yesterday.

"The government has promised a large sum of money for this purpose," said an official at the Ministry of Machine-Building Industry.

According to the official, the ministry already has the capacity to meet the needs of hydro-electric stations until 1990. But output cannot satisfy the demands of thermal power plants.

The ministry is also unable to turn out enough transformers, switches and cables needed by power stations.

To close the gap, a number of measures have been worked out with the emphasis on increasing production of large generating units and boilers for thermal power plants.

The goal, the official revealed, is to produce by 1990 thermal power equipment with the capacity of 10 million kilowatts.

He said the target can be realized only by upgrading existing power equipment factories instead of building new ones.

By upgrading the four major power equipment factories in Habin, Shanghai, Sichuan and Beijing, the ministry expects by 1990 to turn out equipment capable of transmitting and transforming 8 to 10 million kilowatts of high-tension electricity as compared to 4 million kilowatts at present.

Vigorous efforts will be devoted to expanding production of equipment capable of transmitting and transforming electric currents carrying as much as 500,000 volts, and complete sets for transmitting and transforming electricity with a voltage of 110,000 to 220,000 volts.

The ministry's plan is part of the country's efforts to improve the electric industry. According to Fang Weizhong, deputy minister of the State Planning Commission, electricity will be a top-priority item in the Seventh Five-Year Plan now under study.

"From 1986 to 1990," Fang revealed, "China plans to increase its annual electricity-generating capacity by 5 to 6 million kilowatts.

From 1981 to 1985, the target was an average annual increase of 3 million kilowatts. The country's total capacity is expected to reach more than 100 million kilowatts by 1990."

CSO: 4010/96



## APPLIED SCIENCES

### NUCLEAR INDUSTRY MINISTRY AIDS CIVILIAN ECONOMY WITH DEFENSE TECHNOLOGY

OW270812 Beijing XINHUA in English 0748 GMT 27 Dec 84

["Defense Production Technology Helps Civilian Industries"--XINHUA headline]

[Text] Beijing, 27 December (XINHUA)--The Ministry of Nuclear Industry has in the past year transferred more than 300 items of defense technology and research findings to civilian industry, said the ministry here today.

An extraction technology for tungsten-smelting developed by the ministry's No 5 Research Institute and transferred to two factories in Guangzhou City and Fujian Province has yielded a profit of 1,700 yuan on each ton of tungsten processed.

The Tianjin Pharmaceutical Factory, using the technology to produce erythromycin, has raised its income by more than four million yuan annually.

The Zhaoyuan Gold Mine in Shandong Province applied the ion exchange technique in recovering gold, raising the recovery rate of gold by five to 10 percent. The No 5 Institute and the mine have signed an agreement for expansion of gold production.

The ministry's No 2 Design Institute has successfully applied a new technique to the technological designing of breweries. In recent years, it has completed the designs for 10 breweries. The institute is now designing 14 breweries and has received orders from another 20.

The Nuclear Energy Institute has provided businesses with new technologies for analysis, radiation and detection. It now produces 200 isotopes for more than 1,200 users in medicine, agriculture and industry.

Factories and research institutes of the ministry have also turned out new products for the light, pharmaceutical and electronics industries. The No 8 Research Institute in Shanghai developed a thin diamond cutter for silicon chips used in large-scale integrated circuits. China formerly imported these cutters.

Four of the ministry's new products have won the 1984 state silver medals for quality. They are an ion-sensing smoke detector, a zonal fire alarm, an acid-resistant stainless steel ball valve and a compound powder.

The ministry sent scientists to 180 civilian departments in 20 provinces and found nearly 1,000 technical problems to tackle.

China's defence industry began to reorient production in 1979. Factories and research institutes under the ministries of aviation, ordnance and nuclear industry are being urged to turn out more products for civilian use and equipment for the modernization drive.

CSO: 4010/96

## APPLIED SCIENCES

### PROGRESS MADE IN IMPORTING FOREIGN TECHNOLOGY

OW091025 Beijing XINHUA Domestic Service in Chinese 1138 GMT 8 Nov 84

[By reporter Xu Yaozhong]

[Excerpts] Beijing, 8 Nov (XINHUA)--According to information provided by the State Economic Commission, since the beginning of this year China has made very fast progress. The number of technology importation transactions concluded with foreign exchange supplied by the state and the total amount of money involved in the first 9 months this year have already surpassed last year's total. Last year, a total of 666 transactions in technological import involving some \$630 million were concluded. In addition, the various localities also tapped other sources of foreign exchange to import advanced technology on their own last year.

Importing advanced technology to renovate China's existing enterprises is an important policy for developing China's economy. It is also an important means by which China's industrial enterprises make technological progress. The central authorities have decided to import some 3,000 advanced technological items in the last 3 years of the "Sixth 5-Year Plan." Current indications show that it can be accomplished on schedule. Industries importing and applying advanced technologies include light industry, textile, food, packaging, machinery, electronic, medicine, building materials and many others. Their imported technology is bound to have great impact on their technological progress.

A salient feature in this year's technological imports is speed. By taking a series of measures, including giving more decisionmaking power to the various localities, departments and enterprises, relaxing policies, simplifying procedures, and opening more channels for dealing with foreign firms, the state has aroused enthusiasm in both the central and local departments. The pace of technological imports increased during each quarter this year. In the third quarter, the number of transactions concluded and the total amount of money involved were both larger than the total of the two previous quarters combined. Some departments are even able to benefit from their technological imports the same year they are imported.

The State Economic Commission maintains that although the task of technological importing has accelerated, it is only a beginning, and its progress is uneven from department to department and locality to locality. The commission hopes that the various departments and localities strengthen their leadership and improve their method of work, thus fulfilling their technological import task with even better results.

## APPLIED SCIENCES

### BRIEFS

**HYDRAULIC TURBINE BLADES**--Chengdu, 5 January (XINHUA)--China has achieved advanced world standards for research into and manufacture of large hydraulic turbine blades, according to engineers who have completed a 3-year study. The blades, each weighing 42 tons, were manufactured for the two 175,000-kilowatt water turbine generating units at the Gezhouba Hydroelectric Power Station, China's largest on the Yangtze River, and worked well for 3 years. Engineers from the No 2 Heavy Machinery Plant, in Sichuan, and the Zhengzhou Machinery Research Institute, in Henan, cut one blade into thousands of pieces. Close inspection showed that the metallurgy, casting, heat treatment and testing measures all reached advanced world standards. More than 100 professors and technicians from all over the country affirmed this at a recent meeting, and agreed that their research was important to the production of large stainless steel castings as well as the manufacture of even larger hydraulic turbines. [Text] [Beijing XINHUA in English 0631 GMT 5 Jan 85 OW]

**MILITARY CYLINDER HEAD PRODUCTION**--No 7427 Plant of the Fuzhou PLA units successfully manufactured the CA-15 model cylinder head last year. The cylinder head, when revolving 2,800 rounds per minute, is 31 percent higher in mechanical efficiency and 14.9 percent lower in fuel consumption than that of CA-10B model. The PLA General Logistics Department recently issued a circular saying that the plant will produce all new cylinder heads needed in the entire army in 1985, and that a fixed quota of 20,000 such cylinder heads has been set for marketing. [Excerpts] [Fuzhou FUJIAN RIBAO in Chinese 4 Jan 85 p 2 OW]

**XINJIANG ENTERPRISES' TECHNOLOGICAL PROGRESS**--Over the past 2 years, enterprises in Xinjiang Region have made new progress in technological progress. They have made 7,750 kinds of new products. In 1983 and 1984, the amount of investments in technical innovation and transformation in the whole region was 1.2 billion yuan and arrangements were made for 343 key transformation projects, 219 of which have now been completed. In 1984, the region imported from foreign countries 36 technological items, of which 20 were completed. The 20 imported technological items amounted to 14 million yuan, more than the total sum in the preceding 3 years. [Summary] [Urumqi Xinjiang Regional Service in Mandarin 1300 GMT 8 Jan 85 HK]

SHANDONG ASPHALT PRODUCTION BASE--Qilu Petrochemical Company in Shandong Province plans to build an asphalt production base in the next few years. In the next few years, the company plans to produce 600,000 to 800,000 tons of asphalt annually for the state. [Summary] [Jinan DAZHONG RIBAO in Chinese 30 Jan 85 p 1 SK]

COMPUTER-BASED MEASURING EQUIPMENT FROM SWEDEN--Selcom, [a firm located] in Partille, owned by Rang Invest, has sold advanced testing measuring equipment valued at 3 million kronor to China. The firm has previously won a significant market in the U.S. and Japan. General Motors in the U.S. is one of its big customers. The laser-based system [it is selling] is one of the most advanced in the world within the area of non-contact measuring. Selcom this year is expected to increase its earnings by 60 percent, to 40 million kronor. Director Lars-Bertil Ohlson stated that the order from China involves complete computer-based systems for dimension control of rubber details in automotive tire production. [Text] [Stockholm SVENSKA DAGBLADET in Swedish 13 Feb 85 p 28]

CSO: 3650/174

## LIFE SCIENCES

### CHINA'S MODERN BIOENGINEERING, RELATED POLICIES DISCUSSED

Beijing KEYAN GUANLI [SCIENCE RESEARCH MANAGEMENT] in Chinese No 4, Oct 84  
pp 13-18

[Article by Hu Wenxiu [5170 2429 4836] and Liu Yaxian [0491 7161 8300] of the Research Institute of Scientific and Technological Information of the Chinese Academy of Agricultural Sciences: "The Characteristics of the Development of Modern Bioengineering and related policies in China"]

[Excerpts] Modern bioengineering is an important component part of the current new technological revolution. Its major implication is that, by utilizing modern cytology and molecular biology to understand the basic units and materials of such living matters as cells, nucleic acids, chromosomes and genes, and by adopting such accurate measures as tissue culture, cytomixis, gene transfer, and microbiological fermentation, men can utilize, inherit and duplicate the optimal state of the characteristics of all kinds of living things that are favorable to mankind. Then, men can, according to their will, discover the new approaches, new methods, new techniques and new technologies involving a series of biological evolution in producing new species, preparations, diagnostic measures as well as new high-yield, high-resistant and fine-quality varieties. The success in this realm not only has manifested the tremendous progress in modern science, but also will further enhance the development of the social productive forces.

#### I. The Characteristics of the Development of Modern Bioengineering

In the early 1970's, (Shapiro?) and others in the United States successfully carried out for the first time artificial genetic isolation using the genetic segment of the DNA of the colon bacillus. (Hubert?) and (Boyle?) successfully transferred the heterogenic material, that is, the genetic segment, to the colon bacillus, enabling it to produce many kinds of insulin and interferon. At the same time, Tong Dizhou of the Animal Research Institute of the Chinese Academy of Sciences also scored heartening results in the cytoplasmic hybridization of the crucian carp and the gold fish. These successful attempts have broadened the field of vision for the biological circle in the world and further promoted the exploration and development in this realm. Modern bioengineering has finally made important breakthroughs in industry, agriculture, animal husbandry, forestry and medicine, and has created a new state for the biological world. Its development embodies the following major characteristics.

## Extremely Broad Targets of Research.

Since the breakthrough in the early 1979's in cytomixis and gene transfer, these methods have rapidly been applied in the improvement of varieties, distant hybridization, and culture of new plants using pollen, embryo and stem tip, the synthesis of plant alkali, and the formation of products estimated that, by the year 2000, it will reach \$2.1 billion.

Results of Fermentation Engineering: For example, 1,000 tons of dried potatoes with a value of 160,000 yuan can produce 500 tons of white wine with a value of 850,000 yuan; can manufacture 100 tons of monosodium glutamate with a value of 900,000 yuan; can manufacture 395 grams of citric acid with a value of 1.45 million yuan; and can manufacture 500 tons of lactic acid with a value of 2 million yuan.

## II. The Development and Application of Modern Bioengineering

In the last 20 years or so, in particular within the last 10 years, the development and application of modern bioengineering consist of the following major areas.

### Success in Animal and Plant Distant Hybridization

Presently, plant distant hybridization uses radicle separation involving the implantation of gene into a medium that is suitable to different targets, enabling the radicle to survive and develop into a plant. For instance, the crossbreeding of wheat and rye was given rise to a new breed of "small rye." In 1982, the Kansas State University in the United States succeeded in cultivating a new potato that has the antiviral ability of a tomato and that is delicious--the "tomato-potato." Our country has also scored heartening results in the crossbreeding of tobacco and short morning glory, tobacco and soybean, and corn and rice paddy. According to incomplete statistics, through cytomixis, we have obtained 20 varieties, 11 through interspecies cross, 6 through intergenetic cross, and 3 through interracial cross. In respect to animals, crossbreeding the goat and the sheep has brought about a "sheep-goat" that has the head and tail of a goat and the body of a sheep. Our country has also scored initial success in crossbreeding the crucian carp and the gold fish.

As a result of the breakthrough in cytogenetic engineering, new animal and plant species have been created under mankind's control. This is a tremendous contribution to science.

### High Yield and Rapid Reproduction of Animals and Plants Have Become a Reality

In the State of California in the United States, it takes 3 years to produce results by using the regular method of cultivating strawberries. Now, using the method of tissue culture, the isolated culture has brought about virus-free strawberry seedlings, which will produce strong, virus-free,

large and high-price strawberry plants in 6 months, which will bear fruit in the same year, thereby raising output by a wide margin. Japan has also scored success in using this method to cultivate bulbar flowers and plants. Hyacinth and tulip of the liliaceae family, gadiolus of the Iridaceae family, and daffodil and (zhu ding hong 2612 7307 4767) of the Amaryllidaceae family have all become commercial. Through cultivation by pollen, our country has obtained a fine-strain wheat--the "Jing Hua No 1," which has been promoted on 100 mu of land in 1983. In addition, more than 20 new varieties of fine-strain rice paddy, including the "Xin Xiu" and the "Wan Jing No 95t9," have been promoted on 250 mu of land. We have also promoted the "Dan Yu No 1" tobacco strain on a large scale. According to statistics, there were roughly over 600 successful varieties at home and abroad.

In respect to animals, through embryonic implantation and frozen semen, we have greatly accelerated the breeding and reproduction of livestock. For instance, in 1978, Canada used frozen semen to mate over 1.2 million cows. Only 606 male cows were raised. On an average, 1 male cow would mate 2,110 female cows. A fine-strain male cow could breed 500,000 cows in its life. In addition, this could raise the milk output of the dairy cattle. For instance, in the last 10 years, in the United States, the milk output of one dairy cow has doubled (23 percent), thus economizing 88 billion sheng [liters] of corn.

#### New Diagnostic Measures and Technologies Have been Developed.

Breakthroughs have been made in the new technology to develop hybrid lymphocytoma, that is, the technology involving single-clonal antibody. Single-clonal antibody is an accurate tool in immunological research. It has promoted the progress in molecular immunology. On the international market, a half milliliter of single-clonal antibody is sold for \$50 to \$275. In the United States, one hybrid cytoma (patented) was sold to the production company for \$200,000. Since 1982, successful attempts in hybrid cytoma have included the following: Type I and II adenovirus (horse contagious hepatitis), pseudorabies, viral bovine mucosal disease, infectious pig viral gastroenteritis, viral equine abortion (Herpes I virus), Erwinia enterobacillus, brucellosis, Newcastle disease, and marek's disease. Recently, vaccines for mastitis of dairy cattle, coccidiosis of fowl, and blue tongue disease of sheep and cattle have been prepared. The United States, the United Kingdom and Belgium have begun to apply hybrid cytoma in the quarantine of plant viruses.

The technology of cell culture culture is an important measure in cytology and virology. In the method of cell culture, the simple static culture and roll-tube (jar) technique have developed to multilevel culture, culture of soliquoids in large-scale fermentation tank and even culture of soliquoids in microcarriers. The products of cell culture are important tools for isolating and identifying viruses. For instance, equine infectious anemia, bovine rhinotracheitis, bovine mucosal disease, bovine leucosis, swine coronary virus and viral Fabricius bursitis have all been discovered through the use of culture technology together with other assessment methods in physical chemistry and immunoserology.



## The Tremendous Roles of Enzyme Engineering and Fermentation Engineering in Bioengineering

It was reported that in 1983, Japan produced several thousand types of products, totaling 300,000 tons, from enzyme engineering and fermentation engineering. Playing the role of a natural catalyst, enzymes can enable the human body to become temperature convenient. Enzymes also play a role which cannot be ignored in respect to food, medicine, energy and their related basic research. Fermentation engineering has also developed extremely rapidly, and has played a very major role in such aspects as methane fermentation involving microbiological farm chemicals, monosodium glutamate and bacterial methane, in sewage treatment, and in bacterial leaching.

### The Manufacture of All Kinds of Apparatuses and Equipment

At present, we have successfully manufactured cattle sex detector, organic calculator, and bacterial battery. Some people have forecasted that, in order to reduce air pollution and pollution by men and animals, organic products will replace inorganic products, which will enable science to develop to a higher level.

### The Manufacture of All Kinds of Raw Materials and Chemical Products and Mining

Utilizing modern bioengineering, we can manufacture high-intensity fiber or plastic materials, and can use fiber and semi-fiber to manufacture alcohol, inflammable wool and indigo dye. We can utilize microorganisms to change solid organic waste products into fructose and alcohol, and can also utilize the microorganism which likes to "absorb" metallic elements in the mining involving extremely low-grade metallic mines.

Summing up the above, we can see that, in the last decade or more, especially in the last few years, we have made astounding achievements. However, there are several problems in modern bioengineering which have affected the speed of a large-scale development. Awaiting our further study and resolution are the following major problems:

- 1) We have still not solved the problem of a culture medium required in large-scale production.
- 2) Most of the new varieties in agriculture have been obtained in the laboratory. What remains unclear is the feasibility to use the soil of nature as the culture medium and the relationship between the plant's hereditary material and the soil once we make the shift to the field.
- 3) The successfully manufactured new products and new materials must be further tested by radioisotope. However, a complete set of technological line for large-scale production has not yet been formulated.
- 4) In gene transfer and cytomixis, we have discovered inconsistencies with the properties of the original plant. This has posed a great threat to crossbreeding.

5) In the process of nitrogen fixation, the growth of Rhizobium requires the consumption of carbohydrate. This results in the reduction of output of crops. Thus, we must solve the problem of providing carbohydrates for Rhizobium.

6) Modern bioengineering involves a long period of research, large-scale investment and high demand for apparatuses and facilities.

### III. The Prospect of Application of Modern Bioengineering in Our Country and Related Policies.

Up till the present, in tissue culture, our country has attained the world's advanced level in the regeneration of plants through pollen cultivation and radicle cultivation. We have our strong points in the improvement of new varieties, in the acceleration of animal and plant reproduction and in assessment technology. However, we have done virtually nothing in the manufacture of apparatuses, equipment and new materials. In many other aspects, it is estimated that we are 10 years behind foreign countries. In order to better meet the challenge of the new technological revolution, we have put forth the following propositions to be used as reference by concerned decision-making departments and leadership.

#### A. Our Guiding Ideology

First of all, we must understand that modern bioengineering is an important component part of the new technological revolution. Our country has a large population. The per-capita arable land only constitutes one-third of the per-capita arable land in the world. Our foundation is poor. A very good approach to solving the problem of food, clothing and daily necessities of a population of 1 billion is to develop modern bioengineering.

Secondly, by the year 2000, our country should not rely on modern bioengineering as the primary measure for quadrupling our output value. Since the Liberation, we have obtained results in thousands of agricultural scientific research projects. If we propagate and apply them in production, we will have full confidence that we will quadruple our output value. However, most of the results of modern bioengineering are still in the laboratory stage. Thus, our major measure is still to rely on the propagation and application of the results obtained from conventional research. Also, even by the year 2000, we still should not make modern bioengineering a focus at once, but should develop it gradually in a planned manner and with emphasis.

Thirdly, currently, we should take the import of technology as the key and creation and manufacture as the supplement, and develop and import with emphasis the modern bioengineering technology which meets our country's needs and which suits our country's situation. After being imported, it must enter into commodity production, become an industry, and truly become a productive force.

## B. Concrete Proposals

Work in the Early Phase. Before 1990, we must manufacture and import as quickly as possible and turn over to commodity production and formulate industries as quickly as possible the following areas:

- 1) Through tissue culture (pollen, radicle and stem tip), produce large volume of "replica" plants, seedlings and superior trees, and produce large volume of superior algae.
- 2) Through cytomixis and gene reorganization, raise the production of such physiological living materials as biological farm chemicals; improve the growth hormone in microbiological production; produce such successful vaccines as the foot-and-mouth vaccine and vaccine for diarrhea; and develop single-clonal antibody, cell culture technology and all kinds of new immunological technology.
- 3) Through embryonic implantation and frozen semen, raise the output of livestock and polyembryonic reproduction.
- 4) Our country has abundant resources. We must conduct a widespread general survey of the biological resources in Yunnan, Hainan, the various large mountainous districts and other places, bring the superiorities into play and utilize the resources as quickly as possible.

Work in the Middle Phase. Before the year 2000, we must emphasize breakthroughs in the following major areas:

- 1) Using microorganisms to develop single-cell protein products from petroleum, natural gas and many solid organic wastes in order to supplement and develop the protein required in feeding livestock.
- 2) Using cytomixis and gene reorganization to raise the efficiency of producing methane from waste and discarded materials, and using microorganisms and biological reactors to turn forestry products into alcohol, thereby expanding our energy resources.
- 3) Through cytomixis and gene reorganization, strengthen the self nitrogen fixation ability of crops (with the exception of the grass family) and fruit trees, the elm, the pine and the cypress.
- 4) Through cytomixis and gene reorganization, selectively nurture high-yield, high-protein, and high adversity-resistant fine-strain varieties of rice paddy, wheat, corn, Chinese sorghum, tobacco, sugarcane, beet and beans.

In respect to aquatic products, selectively nurture fine-strain fish and crustacean, algae and chlorella, and produce high-quality pearl.

In respect to forestry, produce and "replica" superior tree saplings in large amount, nurture rapid-growth, disease-resistant white poplar which has a high yield of pulp as well as other edible mushroom, and solve the culture medium and new technology involving the test-tube seedlings.

In respect to livestock breeding, utilize reproduction by transfer of nucleus, and "duplication" of fine-strain livestock, and so on and so forth.

5) Utilizing microorganisms to develop low-quality metallic mines, and develop disease-resistant vaccines and hormones for fish. Utilizing microbiological fermentation to develop zymins, amino acids, nucleic acids, sweeteners, polysaccharides, food colorings, antibiotics, perfume, chemical industrial products and materials, and synthetic plant alkali, and to manufacture new materials and new equipment such as organic chips, and all kinds of detectors, reactors and batteries. Utilizing microorganisms and enzymes, we can turn the many high-temperature and high-pressure chemical technologies at present into normal-temperature, normal-pressure technologies; and can manufacture fixed enzymes.

Work in the Long Term. We hope that breakthroughs will be made in the following aspects by the twenty-first century:

- 1) The research on the basic theories and technological lines of genetic, cell, enzyme and fermentation engineering.
- 2) Distant hybridization and the manufacture of new species in agriculture, forestry, livestock breeding and fishery.
- 3) The strengthening of nitrogen fixation ability of all kinds of crops and the formulation of productive forces.

#### C. The Training and Bettering of Skilled Personnel.

In respect to the development and utilization of modern bioengineering, our country is still rather backward. The key to catching up with the world's advanced level in the near future is the training and bettering of skilled personnel. Thus, we propose the following:

- 1) Bring into full play the enthusiasm of the present bioengineering personnel and personnel in the related fields in our country, use them in a centralized manner to make breakthroughs with emphasis. In this way, we can enable bioengineering to develop. The Chinese Academy of Agricultural Sciences has already pooled together the concerned comrades of this academy and formed a bioengineering laboratory accordingly.
- 2) Accelerate the speed of "inviting people to come in and sending people out," in order to fundamentally reverse the problem of the ageing of knowledge and to train leaders in the related fields.

3) Strengthen the investment in mental resources and readjust the present curriculum of the institutions of higher learning and the secondary professional schools. We propose that the concerned institutions of higher learning and the secondary professional schools add such courses as cytology, molecular biology, microbiology, genetics, biochemistry and biology, in order to meet the needs of the development of modern technology. At the same time, we must launch the necessary experimental operations in order to raise the ability in actual work.

4) Set up our country's modern bioengineering committee that has at its core the center of bioengineering development of the State Scientific and Technological Commission and with the participation of various ministries and commissions. This committee will be responsible for the design and implementation of relevant work throughout the country.

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## LIFE SCIENCES

### LASER TREATMENT OF EYE DISEASES

Beijing JIEFANGJUN YIXUE ZAZHI [MEDICAL JOURNAL OF CHINESE PEOPLE'S LIBERATION ARMY] in Chinese No 5, 20 Oct 84 p 324

[Article by Xiao Qingshan [5618 0615 3790] et al: "Long-term Observation of Therapeutic Efficacy of Ruby Laser Treatment of Centro-serosa Choroid Retinal Disease"]

[Excerpt] The centro-serosa retinal choroid disease (hereafter referred to as centro-serosa disease) is one of the common diseases, mostly seen in the middle-aged and in young people. The disease affects the choroid blood vessels when the pigmented epithelium is damaged, causing serosa detachment of the neuro-epithelium of the retina. There is no effective drug treatment for this disease. Although the disease may come into remission without treatment, relapses are common. The only effective treatment method at present is laser focusing therapy. The paper reports on 66 cases (including 68 eyes), not benefiting from drug treatment, with repeated relapses, exhibiting fluorescein seepage points under fluorography. It was proved that for centro-serosa patients with detachment of the retinal neuro-epithelium, under observation of an ocular with a cobalt blue filter, a ruby laser was used for the laser focusing treatment; the laser energy was 0.01 to 0.05 Joule and the light spot diameter was 150  $\mu$ m. A 3-week-long observation was conducted after each treatment; at most, a patient underwent three treatments. Before and after the treatment, examinations of hyperopia and myopia were conducted. Detailed records were made by using an Amsler square field-of-vision chart for checking the central dark points and vision changes, examination with dilated pupil with yellow-spot-zone edema and distribution of seepage points, and whether or not there is concave light reflection at the eyeball center. A fluorographic observation was made on the fluorescein seepage points and the range of retina serosa detachment. The therapeutic efficacy was significant after more than 4 years of visits and observations with a cure rate of 100 percent. There were 49 eyes (72.1 percent) where vision was restored to 1.0 and better, with 37.8 being the number of days required for a cure. After the laser focusing treatment, there were 61 eyes (89.7 percent) cured after 1 treatment; 6 eyes (8.8 percent) recovered after 2 treatments; and 1 eye (1.4 percent), after 3 treatments. No complications were found during treatment, and not a single case had a relapse. The paper discusses the pathogenic conditions of the centro-serosa disease, and the laser function on the pigmented epithelium and choroid; the advantages and disadvantages of direct and indirect focusing by the laser; and a comparison of the therapeutic efficacy of laser treatment for centro-serosa in China and abroad.

The authors report that the average number of days for a cure approaches the number abroad, but their therapeutic efficacy was better than that in China. The paper also discusses problems with the general treatment with the laser for centro-serosa disease. The authors' cases show that for a general treatment with extensive laser use, the disease will worsen, without curing the centro-serosa disease. Hence, this extensive laser use should be prohibited. The authors consider that with the laser focusing treatment of centro-serosa disease, vision can be restored and the treatment time can be shortened, thereby preventing relapses.

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CSO: 4008/144

SHADDOCK RIND PECTIN SOLUTION AS BLOOD SUBSTITUTE

Beijing JIEFANGJUN YIXUE ZAZHI [MEDICAL JOURNAL OF CHINESE PEOPLE'S LIBERATION ARMY] in Chinese No 5, 20 Oct 84 pp 377-378

[Article by Department of Pharmaceutics of Military Medical University No 2, Training Department, and Changhai Hospital: "Shaddock Rind Pectin Solution as Substitute for Blood Serum"]

[Excerpt] Blood serum substitute is an important drug for first aid and treatment of shock; however, at present blood serum substitutes have certain flaws and limitations. For requirements of first aid and treatment of combat wounds, it is necessary to seek a highly effective, safe and low cost blood-serum substitute. The paper reports on a study of extracting pectin from shaddock rind as a blood-serum substitute. In South China, the shaddock resources are abundant while its rind is quite low in price. Studies and comparison were made on shaddock varieties coming from 20 locations. It has been proved that the pectin extraction rate and quality do not vary much in either of these 20 shaddock varieties as the starting material for pectin. Dilute acid and ethyl alcohol are used for extraction and precipitation with a 12 to 14 percent pectin extraction rate. Determined by chemical analysis and infrared absorption spectrum, the end product (pectin) quality meets the quality requirements of blood substitute injection. The molecular weight of pectin can be broken down to the range of 20,000 with the thermal pressure method, and then compounded into 1 percent shaddock pectin solution, containing 0.9 percent sodium chloride. The main component of pectin is methyl ester alpha-D galactase glyoxylic acid. Experiments and studies were made on factors such as affecting methoxy content, viscosity characteristics, and compounding variations. Pectin gradations were attained with the precipitation method; the osmotic pressure method was used to determine grades of  $\bar{M}_n$  and the corresponding  $[\eta]$ . By plotting a graph of  $\lg[\eta]$  versus  $\bar{M}_n$ , a straight-line equation is obtained; k and alpha values can be derived. The formula for the molecular weight of pectin viscosity method is  $[\eta] = 3.23 \times 10^{-7} \bar{M}_n^{1.75}$ , specifying the upper limit of molecular weight of the macro-molecular moiety of pectin. The classic isothermal method is used for the hydrolytic determination of pectin as the false first-grade reaction in deriving the Arrhenius straight line. Extrapolation is used to derive  $K_{20} = 6.606 \times 10^{-6}$  (hour<sup>-1</sup>); the activation energy is calculated as 26.4537 Kcal·mol<sup>-1</sup>; and the estimated shelf life (at room temperature) of the blood-serum substitute  $t_{0.8} = 3.9$  years. A production flow chart has been compiled, along with quality control standards.



By an experiment of treating anti-hemorrhagic shock in 40 dogs, it was proved that the pectin is effective in restoring and maintaining blood pressure, and blood and urine volumes, as well as treating anti-hemorrhagic shock; the survival rate for 72 hours is 83 percent (20/24) but the survival rate of low-molecular-weight dehydrated dextro-carbohydrate is 50 percent (7.14). In experiments with Congo red, it was found that the pectin injection does not affect functions of liver, kidney and mononuclear phagocyte cell system. From experimental results of delayed treatment of canine shock with large severe burn areas, the vital index meets the expected requirements with considerable difference of pulse pressure, similar ranges of osmotic pressure, and no accumulation of lactic acid; these results show that the injection flow among tissues is enhanced, and the efficacy of delayed treatment for severe burn shock with pectin solution is better than with equilibrium saline. Less pectin solution than equilibrium saline is needed with more urine volume. Following multi-animal pharmacology experiments, the results reveal that the pectin solution is free of acute and sub-acute toxicity, accumulation, and foreign-body reaction, as well as free of tissue injury. The pectin solution is also free from heat-caused and allergic reactions, free from phenomena of dissolution, seepage and coagulation of blood; the solution does not affect the blood matching test and blood precipitation rate, as well as the restoration of blood constituents and blood coagulability. From an analysis of pharmacologic dynamics conducted on shaddock rind pectin blood substitutes with 20,000 to 40,000 molecular weight, the results reveal that the elimination of both pectin groups meets the requirements of the first-level rate;  $t_{1/2}$  for two groups are, respectively, 2.4 and 6.95 hours, revealing that the elimination rate of  $M_n$  (20,000 molecular weight pectin) is about three times the other  $M_n$  (40,000 molecular weight pectin). No pectin accumulation in the body was found on histologic examination. Experiments and studies were conducted on  $^{14}\text{C}$ -shaddock rind pectin ( $M_n = 20,000$ ) using radioactive isotope tracer method with LCR mouse intravenous injection for pharmaceutical dynamics, tissue distribution, excretion and metabolism, as well as control observations with  $^{14}\text{C}$ -low-molecule dehydrated dextro-carbohydrate and  $^{14}\text{C}$ -shaddock rind pectin ( $M_n = 40,000$ ); results reveal that the trend of the dynamic distribution of three types of markers is basically consistent. Only pectin of  $M_n$  (40,000) accumulates temporarily in lungs. After 36 days of post-medication in internal organs, increased radioactivity was discovered in the liver, spleen, kidney and bones while lower (but detectable) radioactivities in the heart, lungs, stomach, uterus, muscles, fat, skin and brain. As revealed in metabolism, more than 90 percent of low molecular-weight shaddock rind pectin is present in blood serum, 5 percent is present in the form of galactose glyoxylic acid, while simpler sugar is found only in liver. Discharge of pectin occurs mainly in urine; in the first 3 days, the accumulated pectin discharge in feces and urine is 94.3 percent, from 78.1 percent discharge in urine for the first 8 hours, to a daily discharge of 7,000 to 8,000 dpm on the 20th day. In addition, autoradiography of whole-body radiation was used to assess in-body distribution of pectin, as follows: Images of 3 minutes, 1, 4 and 8 hours after intravenous injection of shaddock rind pectin show instantaneous in-blood distribution within the body with rapid elimination by the kidneys. One hour later, small amounts of drug (pectin solution) were present only in the liver, spleen, lungs and kidney, especially apparent for pectin of  $M_n$  (40,000). Low molecular-weight pectin can pass through the placenta in entering mouse embryos, mainly restricted in the bone marrow of spinal column without exposure in other tissues. From clinical experiments and studies on 10 male

youths to determine the immunological index, results indicate that humans do not have natural immunity to pectin; no heterogenetic antibody exists after repeated examinations, but with gradually increasing levels of serum IgG. There are no visible variations for other immunological indexes, including  $CH_{50}$ ,  $C_3$ , IgA, IgM, anti-DS and DNA antibody. From a deformity-causing study of LACA mice, it was proved that pectin does not cause deformities from three aspects of the death and survival of placenta, its growth and deformity. By using the Ames method and adopting two mutant bacteria ( $TA_{98}$  and  $TA_{100}$ ) with the blending of S-9 mixed liquor, the plate seepage method was employed to examine the mutant inducing characteristic of pectin; results are negative. From observations of 103 clinical cases and 217 surgical cases, pectin shows significant therapeutic efficacy in first aid for severe shock, quickly saving shock patients. During surgery, low blood pressure (caused by hemorrhage or anesthesia) can be quickly corrected; the effect of expanding blood volume is good. There are no undesirable reactions in surgery.

This investigation represents a major breakthrough by solving the blood accumulation problem posed in medical papers. The therapeutical efficacy is apparent by using low pectin concentrations in saving patients in severe shock. Advanced techniques can be applied to provide scientific data for safe applications; thus a new kind of blood substitute is making its advent in peace and wartime applications with safety, efficacy and low price.

The paper was compiled by Tan Yizhong [6151 0001 0022]. A draft was received in November 1983; revision was completed in July 1984.

10424

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## ENVIRONMENTAL QUALITY

### DEFINE ENVIRONMENTAL OBJECTIVES, PERFECT INDEXING SYSTEM

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pp 2-3, 25

/Article by Li Jinchang /2621 6855 2490/, assistant researcher, State Council Technology and Economic Research Center: "Some Tentative Ideas On a System of Comprehensive Indexing For the 'Three Shengs' Social Production, People's Livelihood and Environmental Ecology"/

/Text/ Indices for measuring standards of development have an important significance for guaranteeing the healthy development of an economy and society. A scientific and complete indexing system is able to guarantee and stimulate the healthy development of the economy and society, but single or one-sided indices will lead development astray. Therefore, at the same time that we explore and study models for developmental strategies many people are concerned about the question of diligently determining and perfecting an indexing system for measuring the levels of development.

#### 1. On the Idea of Development and the Question of the Measurement of Development Levels.

For many years now, we have taken a relatively high gross national product as a symbol of prosperity, we have taken an increase in GNP as an indication of development, and we have considered comprehensive policies that wholeheartedly encourage a rise in GNP as developmental strategies for universal use. In addition, we have considered the size of the RENJUN GNP as the only ruler by which to measure levels of development. Consequently, this kind of thinking that unilaterally seeks economic increase brings with it a whole series of unfortunate consequences like employment difficulties, social upheaval and environmental pollution, ecological disruption, energy deficiencies, shortages in food, and the like. This all goes to show that if there is only an increase in the economy this does not mean that there has been true development, but that the problem of "economic increase without development" still exists. In this kind of situation people have questioned the traditional concept of "development" and have begun to look again at the course of world development to study the causes and effects of the world problems currently facing us, to look forward to the future prospects of development, and to seek out new developmental strategies. Now, people have rather commonly realized that economic growth and development are two dissimilar concepts. Development

includes economic growth but it is not just economic growth. Development has a broader significance, and besides economic growth ought also include the gradual rationalization of economic and social structures. It should include the constant advance of science and technology, maintenance of incessant improvement in the material and cultural standard of living for the broad mass of people, and should include the steady improvement of the ecological environment. Therefore, people have gone on to bring up the concepts of full-scale development, comprehensive development, as well as the concept of ecological development. By ecological development we mean development that is sound and can be maintained, which is development that complies with ecological laws.

In the process of constantly revising concepts of development people have taken exception to the GNP indexes for measuring levels of development, and have devised some new indexing systems suited to the new concepts of development.

Some scholars in the West have a particular reason for objecting to GNP indexing as a measure of development levels in strategies of only seeking economic growth. That is, although GNP indexing has the advantages of being simple and to the point, as well as convenient for classifying contrasts, it does not include the achievements of labor throughout society and does not concern itself with factors of environmental pollution and the influence of ecological disruption. Neither does it consider whether distribution of income has been reasonable, and therefore it cannot reflect the requirements of modern society. In the 1960's and 1970's economic losses due to environmental pollution and ecological disruption were great. According to foreign calculations, economic loss due just to environmental pollution stood, in general, at three to five percent of the GNP, and expenses needed for control of environmental pollution were one to two percent of GNP. In Japan, the proportion of "ecological losses" due to environmental pollution and expenditures for environmental protection were 0.2 percent of the national welfare index in 1955, which rose to 13.8 percent by 1970. Economic losses this great have still never been taken into account by traditional GNP indexing. Therefore, environmental concerns have become a major factor in stimulating people to seek out and establish a new indexing system. At present, countries throughout the world have for the most part studied and formulated indexing systems that fit their own requirements and reflect their own characteristics. There are many kinds of these indexing systems, taking many forms, their particular indexing ranging from less than 20, less than 100, less than 1,000, to more than 1,000 items. Many among the indexing systems have a common characteristic and that is that they include at the same time factors of economic development, welfare items, and matters of ecology and environment.

For several years now China has used the index of gross output value for industry and agriculture. In reflecting the production scales and growth rates for the two large production departments of industry and agriculture it has been convenient for studying material relations and proportional connections between industry and agriculture. However, apart from industry and agriculture, the fruits of labor of other material production departments have not been included. What is more, because it calculates according to industrial rules, there are many repetitive factors and it cannot accurately reflect the true scale of national economic developments. Even more important, it lacks content

dealing with benefits and quality, as well as taking no consideration of the effects of environmental pollution and ecological disruption. Consequently, it cannot well reflect the basic goals of socialist social production. Therefore, in recent years several departments in China have been studying and formulating an indexing system to suit China's conditions and initial results have even already been put into testing. Some of them, after appropriate adjustment and strengthening, can better reflect the comprehensive demands of the three aspects of production, life, and ecology.

## 2. Integration of Strategic Goals, Development Patterns, and Measurement Indexes

Whatever kind of strategic goals we have for development, that is the kind of pattern we will have for development, and that is the kind of indexes we will have for measuring levels of development. What developing countries adopted after the war was a so-called "traditional development strategy" that sought economic, namely GNP, fast growth as its goal. The consequences of this sort of developmental strategy have been discussed above. Some developing countries have in the past followed the path of the developed countries, and have adopted a "catch up and surpass strategy" that takes as its goal the meeting and surpassing of economic levels in developed countries, as well as their degree of modernization. But the results have been slow economic growth, increases in the number of unemployed, broadening of the gap between rich and poor, worsening of the ecological environment, serious social problems, and deepening reliance on the developed countries. In order to extricate themselves from this predicament these developing countries have undertaken adjustment and consolidation in the aspects of adjusting economic structures, strengthening agricultural development, controlling population increases, and raising levels of exploitation of labor and resources to form a so-called "improvement development strategy." Some developing countries have proposed so-called "substitution type developmental strategies" or "accommodating developmental strategies" that completely break with traditional developmental strategies, that never again seek rapid growth in the GNP as a goal. The current phase of Soviet economic development strategy may be characterized as trying to catch up with and surpass developed capitalist countries qualitatively and in efficiency.

Not long ago, at a general developmental strategy conference for economics, science and technology, and society held by the State Council Technological and Economic Research Center, Comrade Ma Hong [7456 3163], in the spirit of a series of relevant directives from the central leadership, once summed up China's historical experience of over 30 years of economic construction in strengthening the country. He pointed out that we ought to adopt an "innovative" strategy based on China's national situation and realistic conditions that make full use of all opportune moments and that directly utilizes various new advanced technologies in the world that are suited to our needs. Our goal is to construct a strong modernized socialist country with Chinese characteristics. Therefore, our developmental strategy ought to have three basic features:

1. having Chinese characteristics we cannot copy indiscriminately the models of other countries;
2. persisting along the socialist path, constantly perfecting the socialist system and giving full play to the superiority of that socialist system, we cannot take up capitalism;
3. in modernizing, we cannot rest in the status quo nor be willing to lag behind, but must determinedly and quickly develop and advance.

Vice Premier Li Peng, in a report representing the State Council at the Second National Conference on Environmental Protection, made it clear that "protection and improvement of the environment is a basic national policy for China" and that "by the end of this century China's goals for environmental protection are to strive for a fundamental resolution of environmental pollution throughout the nation, that the natural ecology will recover fundamentally its benign cycle, that the environment and surroundings for urban and rural production will be purified, beautified, and made tranquil, and that the national environmental condition can fundamentally suit the development of the national economy and improvements in the people's material and cultural livelihood." This says that by the year 2000 there will be an obvious improvement in urban environmental quality, that the great majority of pollution from old enterprises will be for the most part controlled, that the serious state of pollution of important water systems and ocean areas will be fundamentally improved, and that the ecological environment will reach a fundamentally sound state. Having realized these goals we will have basically met the requirements of the national economy and social development toward natural resources and will have reached a level of comfort in the people's material and cultural livelihood.

Environmental protection not only has an intimate connection with general strategic goals but also it is itself a strategic problem. China's environmental problems are chiefly created by the fact that the economy, science and technology, and society do not develop in coordination. Therefore, we ought to treat environmental protection as an important component in the overall development strategy for economics, science and technology, and society. At the conference for overall development strategy in economics, science and technology, and society, everyone was very concerned about the problem of environmental protection and many comrades presented constructive ideas. Among them, Du Dagong /2629 1129 0361/, director of the Council for Research Into China's Future, proposed a model for development strategy relating to economic results, social results, and environmental results. It is a comprehensive and balanced model that is unified and takes the "three shengs" of social production, people's livelihood, and environmental ecology into consideration while having Chinese characteristics and upholding a unified coordinated development of the three positions of economics, science and technology, and society of the four basic principles. Everyone was interested in this development model. Because, with only growth in economic output value and without a raising of people's living standards and improvement of the environment, there can be no true development. And true development includes the three aspects of continual growth in the national economy, universal raising of the people's livelihood, and steady improvement in the ecological environment.

Recently, while doing research on development and utilization strategies for the land and natural resources in Xishuangbanna, Comrade Hu Tongyuan /7579 2717 0955/ and Liu Long /0491 7127/ of the Yunnan Province Economic Research Institute, also presented an indexing system, which includes the three kinds of indexes of production, livelihood, and ecology, that is modelled on unification of the three items of economic results, social results, and environmental results, and on integration of social production, people's livelihood, and environmental ecology. Moreover, it does not require complicated mathematical calculations, is convenient and easy to apply, and overcomes the deficiencies discussed above

of GNP indexing and industrial output value indexing rather well. Specifically, this indexing system, composed of the three target indexes of production target indexing, livelihood target indexing, and ecological target indexing, has its overall target index made up by weighting those three, and it is called the comprehensive target index of economic and social development. These target indexes may be respectively referred to as the comprehensive index, production index, livelihood index, and ecological index. The three indexes of production, livelihood, and ecology are in turn each respectively composed by weighting several specific target indexes. The weighted index for each target is based upon the position and function of the target in the national economic and social development, which is to say that they are determined by their degree of importance.

We may see from this that having this sort of "three shengs" indexing system will allow us to link up into one whole the strategic goals, development models, and measurement indexes that reflect the concept of complete development, and ecological development, that is, to merge them into an organic whole. This is something that undoubtedly has positive significance for the guarantee and stimulus of healthy development of the economy and society, and for satisfactorily implementing the grand program determined by the 12th Party Congress of the CPC.

/No 5, 1984 pp 2-4, 13/

/Text/ 3. Design and Calculating Methods of the "Three Shengs" Indexing System

(A) Design of the "Three Shengs" Indexing System

As previously mentioned, the "Three Shengs" indexing system is basically divided into three levels. The highest level is called the overall index of economic and social development. The second level is divided into a production index, a standard of living index, and an ecological index. For the third level, various individual indicators may be devised on the basis of actual needs. However, for the sake of ease in explanation and convenience in deriving calculations, only five specific items are assumed here under each of the indices. These items are for production, standard of living, and ecology. Certainly four levels might be constructed. For example, under the ecology index, an item on the area of erosion control or an item on urban environmental quality might be set up, with the density of sulfur dioxide in the urban atmosphere and the density of particulates in the urban atmosphere being put in the fourth level as subheadings under urban environmental quality. However, because of the shortage of overall data for study, only a simplification can be provided here. The following table explains the three level indicator system:

--Average per capita gross output value of society (yuan)  
 --Average per capita national income (yuan)  
 --Total national financial revenues (100 million yuan)  
 --Labor productivity rate of all personnel in state-owned enterprises (yuan per capita per year)  
 --Total number of scientific and technical personnel in state-owned units nationally (persons)

--Average level of consumption of inhabitants nationally (yuan)  
 --Average per capita per day absorption of heat from food (kilocalories)  
 --Average per capita living area for city and town residents (square meters)  
 --Percentage of school age children in schools (%)  
 --Number of television sets per 100 people (sets)

--Forest cover rate (%)  
 --Density of sulfur dioxide in urban atmosphere (%)  
 --Density of particulates in urban atmosphere (%)  
 --Percent of industrial effluent treated (%)  
 --Multiple use rate of various residues (%)

Production  
Index

Living  
Standard  
Index

Ecological  
Index

Overall Index of Economic  
and Social Development



## (2) Calculation Methods

There are two main points in the method of calculation for the "Three Shengs" index system. The first is determination of base value. Either beginning year numerical values may be used to figure base value or target numerical values may be used to figure base value. The situations described above used target values to figure base value. Here, beginning year numerical values will be used to figure base value. The second is use of weighted units. This means ascribing a weighted figure for the degree of importance of each individual specific indicator index in the national economy and development of society. Then, weighted units are added to each indicator index at each level to derive the corresponding overall indicator index.

Now, let us assume that 1980 numerical values are the base value, and let us further assume the numerical values completed for the years 1981, 1982, and 2000, correspondingly weighting each item to derive the following individual calculations:

### 1. Production Index

Item	Weighted Figure	1980	1981	1982	2000
(1) Average per capita gross output value	0.20	860	900	970	2,800
(2) Average per capita national income	0.25	370	390	420	1,230
(3) Total national financial revenues (100 million yuan)	0.15	1,085	1,089	1,124	4,340
(4) Labor productivity rate of all personnal in state- owned units (yuan.capita.year)	0.25	12,080	11,860	12,100	30,200
(5) Total number of scientific and technical personnel in state-owned units	0.15	528	571	626	2,000
Production index after adding weighted units	1.00	1.00	1.03	1.13	3.28

Production indices for 1981  
were as follows:

$$\begin{array}{l}
 (1) \quad 900/860 \times 0.20 = 0.21 \\
 (2) \quad 390/370 \times 0.25 = 0.26 \\
 (3) \quad 1089/1085 \times 0.15 = 0.15 \\
 (4) \quad 11860/12080 \times 0.25 = 0.25 \\
 + \quad (5) \quad 571/528 \times 0.15 = 0.16 \\
 \hline
 1.03
 \end{array}$$

Production indices for 1982 were as follows:

(1)	$970/860 \times 0.20 = 0.26$
(2)	$420/370 \times 0.25 = 0.28$
(3)	$1124/1085 \times 0.15 = 0.16$
(4)	$12100/12080 \times 0.25 = 0.25$
+	$626/528 \times 0.15 = 0.18$
	1.13

Production indices for 2000 are as follows:

(1)	$2800/860 \times 0.20 = 0.65$
(2)	$1230/370 \times 0.25 = 0.83$
(3)	$4340/1085 \times 0.15 = 0.60$
(4)	$30200/12080 \times 0.25 = 0.63$
+	$2000/528 \times 0.15 = 0.57$
	3.28

## 2. Standard of living indices:

Item	Weighted Figure	1980	1981	1982	2000
(1) Average consumption level nationally (yuan)	0.30	227	249	266	770
Average heat absorption per day per capita (kc)	0.20	2,590	2,670	2,780	3,300
Average per capita living area for city and town people (square meters)	0.30	4.5	5.0	5.6	8.5
School age children in school (	0.10	94	94	93	99
Number of television sets per 100 people (sets)	0.10	0.5	1.5	2.7	25
Standard of living index after adding weighted figures	1.00	1.00	1.27	1.57	6.95

Using the same method used in 1 above, computation results have been added directly to the table. Specific calculations omitted.

## 3. Ecological Index

Item	Weighted Figure	1980	1981	1982	2000
(1) Forest cover rate (%)	0.30	12.7	12.7	12.5	20
(2) Density of SO <sub>2</sub> in urban atmosphere (%)	0.15	75	78	80	100
(3) Density of particulates in urban atmosphere (%)	0.15	15	17	13	80
(4) Percentage of industrial effluent treated (%)	0.20	14	15	17	76
Multiple use rate of various residues (%)	0.20	20	22	24	60
Ecological index after adding weighted units	1.00	1.00	1.06	1.07	3.16

Using the method used in 1 above, computations results have been added directly to the table. Specific calculations omitted.

## Overall Indices

Items	Weighted Figure	1980	1981	1982	2000
Production Index	0.40	1.00	1.03	1.13	3.28
Living Index	0.30	1.00	1.27	1.57	6.95
Ecological Index	0.30	1.00	1.06	1.07	3.16
Overall index after adding weighted units	1.00	1.00	1.11	1.24	4.35

Overall indices for 1981 were:

$$1.03 \times 0.40 + 1.27 \times 0.30 + 1.06 \times 0.30 = 1.11.$$

Overall indices for 1982 were:

$$1.13 \times 0.40 + 1.57 \times 0.30 + 1.07 \times 0.30 = 1.24.$$

Overall indices for 2000 are:

$$3.28 \times 0.40 + 6.95 \times 0.30 + 3.16 \times 0.30 = 4.35.$$

The results derived from the hypothetical data show an 11 percent increase for 1981, a 24-percent increase for 1982, and a 335 percent increase for 2000 over 1980 in the overall index for economic and social development.

Were different areas, different provinces, different urban districts, or even different countries to use a similar index system and calculation methods, overall indices for economic and social development could be compared, making it possible to see the level of overall development and who is high and who is low.

### 4. Problems Requiring Study

The ideas presented here on integration of strategic goals, development models, and measurement criteria as well as on an overall index system for production, standard of living, and ecology overcomes some of the shortcomings of purely national production gross output value indicators and gross output value indicators for industry and agriculture also reflect and promote, in a fairly all-around way, overall growth of the national economy, the overall increase in the people's standard of living, and the steady improvement of the environmental ecology. They are also of positive significance at the same time in deriving the economic benefits, social benefits, and environmental benefits realized.

Nevertheless, perfection of this "Three Shengs" index system will require a great deal of additional work and the carrying out of thorough research. Several initial problems that have been preliminarily envisaged are as follows:

(A) For the specific index under production, standard of living, and ecology in the third level, just what categories should be set up or not set up as being most representative and as being most able to portray problems, and just how many categories would be reasonable and feasible requires careful study before making a determination. The five specific indicators provided above under

production, standard of living, and ecology are just simple hypotheses, and they are neither complete nor totally rational. They are only to be used temporarily to show a train of thought.

(B) Postulation of weights is very important. The weighted figures assigned the production index, the standard of living index, and the ecology index are currently 0.4, 0.3 and 0.3 respectively, and they have been hypothesized informally to explain problems. Just what assignment of weights would be made in reality would have a bearing in understanding the relative importance of production, standard of living and ecology, and would also have a bearing on programs and policies. Consequently, a rational proportional relationship among them and selection of appropriate weighted figures can be determined only through careful study and scientific calculations. Without it, other problems may arise. For example, using weights of 0.4, 0.3, and 0.3, because of the fairly small difference in the relative weighted figure for production, the weighted figure for ecology is relatively fairly large resulting in a not very rational situation of very little difference between the overall indices for Shanghai and Beijing versus the overall indices for Xinjiang and Tibet. As another example, since the initial base figure is very small for the number of television sets per 100 people under the standard of living index, if the weighted figure used is fairly small, a very great increase would occur in the standard of living index, and that would not appear to be very reasonable.

(3) The index system proposed here is for judging the level of development. How it should be related to and coordinated with assessment indicators used in enterprises are also problems requiring much study.

Therefore, it is proposed that quarters concerned devote further study to the "Three Shengs" index system.

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## ENVIRONMENTAL QUALITY

### CHINA'S ENVIRONMENT IN YEAR 2000 DISCUSSED

Beijing ZHONGGUO HUANJING . BAO in Chinese 13 Nov 84 p 3

[Article by Qu Geping [2575 2706 1627]: "China's Environment in the Year 2000"]

[Text] Our country has already formulated a goal of economic development to quadruple the gross value of industrial and agricultural output, that is, to increase from 707.7 billion yuan to 2,800 billion yuan, by the end of this century. This is a grand and inspiring goal. With the realization of this goal, the livelihood of the people of our country will reach a level of "comfort."

What impact will such a scale and speed of economic development bring to China's environment? What countermeasures should we adopt? What will our country's environment be like by the year 2000? All these are questions that attract worldwide attention.

Our country's environmental issue is very much similar to our population issue. If we do not pay attention to this issue now, then, by the end of this century, the state of our environment may be as bad as the state of our population today. For a long time in the past, we have failed to understand the seriousness of our population problem, and have failed to adopt active measures accordingly. As a result, we are put in an extremely passive position today. To change this state may require several decades or even a century. This is a profound lesson! The environmental issue is like the population issue. Once pollution and destruction result, it will take not only a tremendous amount of funds but also a very long period of time to effect a recovery. Sometimes, there may never be a recovery.

At the Second National Conference on Environmental Protection, the leading personnel of our government have announced that: Environmental protection is basic guarantee and strategic task for the modernization, and is a basic national policy. They also defined the basic guiding ideology for environmental protection as follows: We must carry out synchronous planning, implementation and development for economic construction, urban and rural construction and environmental construction, and unify economic results, social results and environmental results.

As an old saying goes: "In all matters, advanced planning leads to accomplishment, and lack of advanced planning leads to failure." That is to say, in doing anything, we should, on the basis of scientific forecast, formulate a feasible plan that will enable us to make accomplishment actively. Only in so doing will we succeed. Otherwise, we will encounter failure. Thus, in launching forecast and research on "China in the year 2000," the Technological and Economic Research Center of the State Council has listed environmental forecast, socioeconomic forecast, and scientific and technological forecast as the three major systems of parallel importance.

A topic discussion group on the environmental forecast for China by the year 2000 has been established in 1983. The Minister of Urban and Rural Construction and Environmental Protection has taken the lead in this work. Also taking part in this scientific research are several hundred specialists, scholars and practical workers of the Chinese Academy of Sciences, the Chinese Academy of Social Sciences, the concerned ministries and commissions under the State Council, and the concerned scientific research, teaching and management organs of the various provinces and municipalities. The general headquarter is stationed in the Beijing Municipal Scientific Research Institute in Environmental Protection.

#### Our Goal of Struggle in Environmental Protection by the End of This Century

We must strive to basically solve nationwide environmental pollution, basically effect a benign cycle of the natural ecology, bring about a clean, fine and quiet environment in urban and rural production and livelihood, and enable the environmental condition throughout the country to basically correspond to the development of the national economy and the improvement of the people's material and cultural livelihood. In order to realize this goal, our strategic measures must correspond to, coordinate with and at the same time run parallel to our economic development. In the first 10 years when we are laying the foundation for our economy, we must primarily rely on implementing appropriate policies and strengthening management, and control further environmental pollution and ecological destruction. In the following 10 years when our country's construction enters a stage of economic revival, we shall primarily rely on technological transformation and the rational development and utilization of our natural resources, and launch the building of an ecological environment in a planned and all-round manner.

#### Our Strategic Principle in Environmental Protection

--We must implement the principle of a harmonious development between the economy and the environment. We must develop our economy as well as protect our environment. We must score economic results as well as environmental results.

--We must implement the principle of taking prevention as the key and of integrating prevention and treatment. We must avoid the footsteps of some developed nations in "pollution first, treatment later." Our approach should be an active one that involves less money and greater results.

--We must launch the comprehensive utilization of our natural resources. We must turn the industrial and agricultural discharged materials into resources, and realize the goal of "turning harm into good and turning waste materials into things of value."

--We must develop new technology, new techniques and new equipment for pollution control which are suitable to China's situation. This is an important aspect of pollution prevention and treatment and environmental improvement.

--We must pay attention to overall and rational planning. We can control pollution and destruction through a rational planning for the development of industrial structures of low-energy consumption and low pollution and the full utilization of all natural purification capacities.

#### The Contents of Research in the Forecast of "China's Environment in the Year 2000"

There are 13 areas, including: an outline forecast of the environment in the year 2000; a forecast of the science and technology of environmental protection; a review and study of the environmental quality; environmental investigation and research on the countermeasures for pollution control; a forecast of the trend of development in land utilization; a forecast of the utilization of water resources and water pollution; a forecast of atmospheric environment; a forecast on the production and utilization of solid waste materials; a forecast on physical pollution; a forecast on the trend of human health; a forecast on the pollution of farmland; a forecast on the ecological environment; and a forecast on the social environment.

Presently, the first topic involves an outline forecast and research of the interrelationship between economic development and environmental quality and the trend of development on a macroscopic scale in China in the year 2000. This work has been brought to a temporary close. We are launching other forecasts in an all-round and urgent manner, and are planning to accomplish all the topics by 1985.

The outline forecast has set up and applied a mode of forecast on the macroeconomic-environmental system. It takes the method of systems dynamics as the key and uses other methods of forecast as well. It is composed of 14 submodels, which include 8 economic models, 5 environmental models and 1 general model. It includes roughly 3,000 formulae and over 2,000 variables, of which roughly 1,000 are economic and population variables and 1,000 are environmental variables.

The economic model is used in exploring the laws involving economic development and the changes in the economic structure. Its focus lies in manifesting the macroeconomic system as well as the dynamic relations among population, resources, production and distribution. The environmental model takes population and economic forecasts as the prerequisites, and focusses on exploring the dynamic relationship between the emergence and development of environmental pollution on the one hand and the direction, measures, investment, losses and results involving treatment on the other. The general model takes the

economic and environmental models as the basis. Through analysis and abstraction, it sums 350 primary environmental and economic variables, and focuses on exploring the reciprocal roles among these variables and the overall trend of development and change.

The macroeconomic--environmental outline forecast has studied four programs available for selection:

If the spending in environmental treatment constitutes 0.5 percent of the national income, then, by the year 2000, environmental pollution and ecological destruction will be further intensified.

If the spending constitutes 1 percent of the national income, then, by the year 2000, we will have basically maintained the present environmental condition.

If the spending constitutes 1.5 percent of the national income, then, by 1990, we will have basically controlled the trend of development in pollution and destruction. By the year 2000, the environmental condition will be improved rather conspicuously.

The research has indicated that these three programs will not have any obvious impact on the economic growth and the improvement of the people's livelihood. By the year 2000, the gross value of industrial and agricultural output will quadruple, giving a total of over 2,800 billion yuan, and per-capita consumption will reach a level of comfort.

In the forecast, we have also studied the program of investing 2.5 percent of our national income in environmental treatment. The calculation shows that, although there will be greater improvement in our environmental quality if we execute this program, yet the results of the investment as well as the impact on our economy will not be better than the program involving 1.5 percent investment. An analysis of expenses and results has shown that, in the program involving 1.5 percent, spending 1 yuan on environmental treatment will bring about 6.6 yuan of results, while in the program involving 2.5 percent, only 4.1 yuan of results will be obtained.

According to the calculations from the models, the economic losses brought about by environmental pollution have constituted 5.4 percent of the GNP for 1980. By the year 2000, the losses from pollution for the four programs will separately be 10.4 percent, 6.7 percent, 5.3 percent and 4.5 percent of the GNP.

Of course, the harm incurred by pollution is far more than this. In reality, not all the harm can be measured by money. It is difficult to estimate the many kinds of impact on human health and the national ecology. However, studies have pointed out that the profit from the reduction of losses due to pollution more than compensates the expenses in environmental treatment.

In formulating our environmental strategies, we must not go beyond the actual ability of our national economy in emphasizing environmental protection in a



onesided manner. However, we must also take into full consideration the basic requirements for people's health and for an ecological balance. The outline forecast shows that, in the four selectable programs, the programs involving 0.5 percent and 2.5 percent are not practicable. The program involving 0.5 percent sacrifices the environment. Although it can attain immediate speed of development and economic results, it will have difficulty sustaining the results due to the destruction of the ecological environment and the serious waste in natural resources. The program involving 2.5 percent pays too high an economic price. It is undesirable from the viewpoint of economic results. The two programs involving 1 percent and 1.5 percent differ very little in their impact on industrial and agricultural production and the level of per-capita consumption. However, they differ vastly in respect to environmental quality. While one basically maintains the present level, the other will bring about obvious improvement. Of these two feasible programs, the program involving 1 percent is configured from the lowest possible level of demand. The program involving 1.5 percent, however, is the best in terms of both the demand for environmental quality and the impact on economic development.

The macroeconomic environmental outline forecast model has also studied the relations between environmental quality on the one hand and population growth, economic development, utilization of resources, urbanization and scientific progress on the other.

The Expected Goals of the Research in the Forecast of "China's Environment in the Year 2000"

--It must be integrated with the establishment and perfection of the statistical system on the data of the whole environment. Through the investigation, collection, analysis and compilation of materials involving the resources and conditions of the ecological environment, we should set up an environmental database and draw up diagrams on the conditions of the ecological environment throughout the country.

--It must be integrated with the study and decision-making involving environmental countermeasures. This means to integrate explorative forecast with normative forecast. Environmental forecast should be the basis for the research in environmental countermeasures and should provide a relatively scientific basis for environmental decision-making.

--It must be integrated with the formulation of overall environmental plans. After finding out about the trend of development and change of the environmental conditions and their restrictive factors, we should begin to formulate feasible overall environmental plans. Only by integrating environmental forecast with environmental planning can we effectively implement the practical measures in preventing the deterioration of the environment.

--It must be integrated with the organization of an environmental scientific and technological rank and the determination of the direction for environmental scientific research. Through research in environmental forecast, we can organize and train a rank of personnel who can conduct scientific

research and management in the environmental realm, as well as select a group of major environmental scientific research topics which will promote the development of the environmental sciences.

The research on "China's environment in the year 2000" is the first nationwide environmental forecast in China. It must possess rich social, economic and environmental data and information, must master the news regarding the goal of economic and social development and trend of change, and must set up theories and methods of environmental forecast that is suitable to China's situation. It must include environmental forecast models. Exploration and research in all of the above have begun.

In short, there is a good beginning in China's research in environmental forecast.

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## ENVIRONMENTAL QUALITY

### QU GEPING ON STRATEGIC PROBLEM OF ENVIRONMENTAL PROTECTION

Beijing ZHONGGUO HUANJING KEXUE [ENVIRONMENTAL SCIENCES IN CHINA] in Chinese  
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[Article by Qu Geping [2575 2706 1627]: "The Strategic Problem of  
Environmental Protection in China"]

[Text] Strategy for Environmental Protection of Water

The annual volume of surface runoff in China is about 264,000,000 cubic meters, ranking sixth in the world. In terms of per capital annual runoff, China's figure is only 2,600 cubic meters, equivalent to only one-fourth of the per capita amount of water in the world and ranks 17th in the world. China is not abundant in water resources.

As a whole, China has more water resources in the southeast and less in the northwest. The Chang Jiang river basin and areas south of the Chang Jiang, with 33 percent of all cultivated land area in China, have 70 percent of all water resources. In terms of time distribution, since most regions in China are in the monsoon climatic zone, rainfall and runoff are mainly affected by the intensity and movements of monsonal climate, which results in uneven distribution throughout the year. Variations from year to year are also considerable.

In terms of the water quality, because of pollution by large amounts of industrial effluent, daily sewage and other toxic waste materials, the quality of water of China's rivers, lakes, reservoirs and sources of ground water has shown varying degrees of decline. One-fourth of all freshwater in China has been polluted. Large and small rivers that flow through cities have almost all become foul ditches. According to a survey of 53,000 kilometers of river in China, 23.3 percent is no longer suitable for irrigation because of pollution while only 14.1 percent meets the standards for drinking and use in fishery. The problem of groundwater is also great. According to a survey of 47 cities, the groundwater of 43 of them have been polluted and the content of many toxic and hazardous substance has exceeded the state standards for drinking and use.

Water pollution has further reduced China's usable water resources thereby intensifying the contradiction of water shortage. Right now, many cities throughout the country lack sources of water and have a shortage problem.

According to a nationwide survey of 236 cities, there is a daily total shortage of more than 12,400,000 metric tons of water which is equivalent to about 13.5 percent of the daily supply capacity of all Chinese cities. According to incomplete figures, China has an average of 40,000,000 people and 30,000,000 heads of livestock with a water problem and annually there is an average of 300,000,000 mu of drought area. Consequently this has created enormous economic losses.

In order to solve the situation of China's serious water pollution and shortage of water resources, we suggest that by the year 2000 we should increase the re-utilization rate of China's industrial water from less than 20 percent at present to 80 percent; increase the rate of waste water treatment from the present 14 percent to above 76 percent; raising the water quality of rivers that flow through cities to the state's secondary standard for surface water; raising the quality of water in lakes and reservoirs according to their functions to state specified standards for irrigation, fishery and drinking; raising the quality of coastal waters to state specified standards for seawater; and raising the quality of water of coastal fishery areas to standards of water for industrial use.

The basic measures to realize the above-mentioned goals are: rational development, water conservation, reduction of discharge, purification treatment and re-utilization.

#### 1. Rational Development

To develop and utilize China's water resources rationally, we must first change our long-time management system for water resources of "each doing things his own way" and "having five dragons regulating the rivers." Concerned departments in water conservancy, environmental protection, geology, communications, agriculture and aquatic products should jointly form management organs for water resources at state, basin and local levels; we should unify planning, management, development and protection of water resources in the country as a whole. Their main task is to formulate three-in-one regulations, guiding principles and policies concerning the development, utilization and protection of water resources; do a good job in the control of water systems and in the program of supply and discharge of water for industry, agriculture and cities; study and approve programs of development and utilization; provide coordination in dealing with contradictions of supply and demand which involve multiple provinces, cities, trades and departments; supervise the implementation of various laws and regulations; organize scientific management, allocate rationally and balance supply and demand.

Second, we must formulate laws and regulations. Apart from the existing "Environmental Protection Law," we must also formulate water resource protection law and water basin management that suit our national conditions. At present we urgently need to formulate the water environmental protection law that is comprehensive and that can be implemented jointly by many departments. At the same time, we must

organically combine the traditional water conservancy plan for river basis and water quality plan for river basins. Moreover, we should formulate a nationally unified plan for the comprehensive development, utilization and protection of water resources. On this basis we should earnestly do a good job in individual water resource development projects, cascade development projects and evaluating the environmental impact of water resource development and utilization of all river basins.

Third, we must give full play to the comprehensive functions of water bodies so that they will play their role in industrial and agricultural production, the everyday use of water by the people, shipping, power generation, environmental protection and aquatic products. In order to improve the water quality, at the same time when we satisfy a certain degree of power generation and release of water for shipping, we should adopt methods such as increasing the volume of discharge, building more comprehensive utilization reservoirs which will primarily improve water quality, drawing water from other basins to wash away pollutants, dredging river beds and pumping oxygen into rivers. We should enhance the dilution and self-purifying ability of rivers as much as possible and reduce water pollution. In the critical period when the quality of water is worst, we should proceed from the overall interests of the society and give preferential consideration to requests for discharge to improve the quality of water.

## 2. Conserve the Use of Water

In the current state of water consumption in China, the shortage of water supply is severe while the waste of water is alarming. Wastefulness is particularly prominent in industry and agriculture which constitute the absolute majority of water consumers. Numerous localities use flood irrigation in agriculture, with a water utilization rate of merely 30 percent and some have intensified the danger of waterlogging of alkali. The per unit water consumption of China's industrial products is several times higher than that in industrially developed countries and in some cases it is higher by one quantity grade. Higher water consumption is not only a waste of resources but it also greatly increases the discharge of waste water thereby worsening the pollution of water quality. For this reason, water conservation is a positive and long-term policy of environmental protection.

The key areas of water conservation are primarily agricultural and secondarily industrial water consumption. On this basis we must also stress water conservation in everyday life. Therefore, on the principle of distribution of water resources, we should first assure water for urban living and industrial production, give consideration to agricultural use and avoid the contradiction of industry and agriculture vying for water.

In order to economize on agricultural consumption of water, we must gradually practice planned consumption and adopt the method of charging according to the number of cubic meters, popularize advanced irrigation techniques of water economization and increase the utilization coefficient

of ditch systems by preventing seepage in drip irrigation, spray irrigation and other irrigation methods. We must seek new agricultural techniques by suiting measures to local conditions and turn irrigation farming into dry crop farming in some semi-arid regions.

The emphasis of economization of water in cities should be put on industry. Major measures are as follows:

(1) Set quotas for water consumption and practice planned usage. In accordance with the different production techniques and water consumption standards of various factory units, set up advanced and rational water consumption quotas to be used as the basis of planned water supply to factories. From factories and workshops to facilities with high water consumption, every level should install meters and follow planned usage. Moreover, water conservation should be linked to the responsibility system of economic results and used as an index in assessing enterprise management.

(2) Improve technological equipment to lower per unit water consumption. The technological equipment of China's industry is backward and has great potential for water conservation. We must improve production technology that has high water consumption and develop technology that uses little or no water, strictly control industrial production that has a high water consumption so that the per unit water consumption of China's industrial products will catch up with advanced levels in the world as soon as possible.

(3) Adopt economic measures and carry out a system of reward and penalty. Water supply departments must assure planned water supply. Those who exceed their quotas in water consumption will be charged extra accordingly or their supply will be reduced or cut off. Those who use less than their planned quotas may take out cash rewards from the water charges economized.

(4) Centrally manage urban water resources. All units which use urban water resources including those with self-equipped wells and surface water generating facilities should all conform to central management, come under planned consumption of water, pay water resource fees and be strictly forbidden to drill wells freely and exploit excessively.

### 3. Reduce Discharge

Industrial effluent constitutes about 80 percent of the waste water annually discharged in China. For this reason, reducing the discharge volume of industrial effluent and its concentration of pollution is a basic measure in preventing water pollution. We should begin with comprehensive utilization of resources and energy, turn raw materials into products as much as possible through environmental management, technological improvement, updating of equipment, comprehensive utilization and other ways of utilization thereby minimizing the discharge of waste water and its waste materials. This is a positive way to reduce the discharge volume of waste water and its concentration of pollution.

#### 4. Purification Treatment

It is highly necessary to spend a certain amount of investment, adopt the proper engineering facilities and undertake purification treatment of waste water in accordance with the demands for environmental protection as stipulated by the state. Using purification treatment to qualify waste water for discharge is an important link in protecting the environment and preventing it from pollution by waste water.

In the light of China's relatively backward economic development and serious actual conditions of water pollution, we should proceed from China's national strength, determine the classes of waste water treatment and the form and techniques of purification by suiting measures to local conditions and in accordance with the nature of the waste water, usefulness after treatment, and the economic levels and natural conditions of all parts of the country. Organic industrial waste water which is heavy metallic and hard to be degraded should be controlled in workshops or treated on the spot in factories to be discharged only after it is up to standards. Industrial waste water with other organic matters should undergo total quantity control before it may be merged with city sewage which should be collectively treated after it enters the city sewage treatment system. Judging from the current actual conditions in China, it is still difficult to realize national popularization of middle class purification treatment. Therefore, we must adopt a variety of treatment facilities according to the specific conditions in all parts of the country. We must study and popularize simple sewage treatment techniques which have high efficiency and low energy consumption, economize on investment, take up little space and have low transportation costs. In particular, we must consider combining artificial treatment and natural purification abilities and study comprehensive treatment methods. For example, the aquatic organism--oxidation pond--waste water irrigation purification treatment system of low concentration organic waste water; anaerobic fermentation--methane--sludge application of fertilizer treatment system for high concentration organic waste water; using industrial waste water and residue to produce microfertilizers, and so forth.

#### 5. Re-utilization

At present, various countries in the world regard increase of water re-utilization rate an important measure to control water pollution and protect water resources. In China's industrial consumption of water, re-utilization has seldom been stressed and waste is tremendous. Most of industrial effluent in fact needs no treatment or it requires only simple treatment before it can be used again. In particular, cooling water is not polluted after it is used except that its temperature has risen, and the adoption of some simple cooling process it may be re-used entirely. Under the right conditions, even closed circulation is possible. According to estimates, if the average industrial water re-utilization rate in China is increased from the current 20 percent to 40 percent, 18,000,000 metric tons of water can be economized each day with a corresponding savings of

3,600,000,000 yuan in investment on water supply engineering construction; the quantity of water economized and the economic results are quite attractive. Therefore, we should first stress increasing the water re-utilization rate. Developing this potential for water conservation does not require complicated technical measures and can achieve low investment and quick results. In the period of the Sixth Five-year Plan, cities with a re-utilization rate under 40 percent should increase it by 6 to 10 percent annually; those above 40 percent should increase it by 2 to 5 percent annually; and those cities with an industrial water re-utilization rate under 40 percent generally should not be allowed to build new industrial water supply projects. We should strive to achieve about 80 percent of the current advanced level abroad in our re-utilization rate of industrially used water by the year 2000. This will make it possible for us to realize a basic improvement in the state of water environment at the same time when our economy is revitalized.

Measures to increase the re-utilization rate of water are as follows:

(1) Split flow of clean water and sewage. Split-flow systems should be set up for water discharged from industry and everyday use according to differences in water quality. Normally they can be divided into 3 cases. First, clean and good water, such as various types of indirect cooling water, which can be re-used after its temperature is somewhat lowered. Second, water discharged has certain impurities but is easy to separate and can be used after some physical treatment. Third, water discharged must undergo purification treatment before it can be returned to water bodies or re-used. Therefore, setting up split-flow systems of clean water and sewage can prevent pollution of clean water by waste water, which will not only greatly reduce the discharge volume of waste water but will also initiate conditions for water re-utilization.

(2) Multiple use of the same water, recycling for use. According to the different demands on water quality by different production technology, the same water in a factory can be for multiple or inter-factory use. At present we should stress recycling various types of cooling water which constitute 70 percent of the water used in industry. This is the portion with the greatest potential for conservation in industrial use of water and which plays a major role in easing the contradiction between supply and demand in water resources. According to survey estimates, in order to realize the recovery of this water for re-use, the annual average unit investment is merely 20 to 100 yuan per cubic meter per day, while it will require at least 300 yuan per cubic meter per day by means of broadening sources. If we calculate on the basis of an annual total industrial water consumption of 30,000,000,000 metric tons nationwide at an average unit investment of 50 yuan per cubic meter per day for the recovery and re-use of cooling water, the annual investment for the recovery of 21,000,000,000 metric tons of cooling water will be 3,200,000,000 yuan, a mere 16 percent of the 20,000,000,000 yuan investment on broadening resources. The economic results of recovering cooling water is very obvious.



(3) Return of waste water to the fields. Re-utilize waste water after treatment, or setting up so-called "intermediary waterway" system, and open a third source of water after surface and ground water sources. This is the general trend at home and abroad and it has many strong points, economizing on water and reducing water pollution. Based on the nature of the water, waste water after treatment can be used in the following ways. First, it can be re-used in industry for cooling, boilers, oil wells, mineral processing, washing, fire protection and production technology. Second, it can be re-used in cities for public facilities, recreation, scenic areas, returning to the ground and some can even be used for drinking. Third, it can be re-used in agriculture for the irrigation of fields and for fishery.

### Strategy for Protecting the Natural Environment

Many features of China's natural environment differ from other countries. Of its 9,600,000 square kilometers of territory, most of the regions are in the temperate, warm temperate and subtropical zones with excellent conditions of light and heat. The southeastern regions are under strong monsoonal influence while the northwestern regions are clearly under continental climate. The regions in half of the area are humid and semi-humid and the other half arid and semi-arid, with drastic differences in moisture content. But precisely because of monsoonal influence, there is rain and heat in the vast subtropical regions of China in the same period of time which is highly beneficial to vegetation growth. Mountains, hills and plateaus constitutes about 66 percent while plains constitute only 34 percent of the total area. Due to its complex topography, varied climates and slight influence by the Quaternary glaciation, it is abundant in animal and plant species and the varieties of soil and vegetation. All this form a unique natural environment in China and provides us with highly advantageous conditions for a diversified economy and development in agriculture, forestry, animal husbandry, side-line production and fishery.

However, there are some unfavorable conditions in China's natural environment. For example, biological resource per capita is low. Cultivated land per capita is 1.5 mu, which is 27 percent of the world average; grassland per capita is 4.3 mu or 38 percent of the world average; and forest land per capita is 1.8 mu or 12 percent of the world average. Besides, the natural environment is varied so that we absolutely cannot be arbitrary in exploiting and utilizing it. Under these natural conditions, the ways to suit measures to local conditions, to give full play to the superiority of our natural conditions, to develop what is useful and avoid what is not and to increase biological output by achieving greater, faster, better and more economic results have become a major guiding principle for protecting China's natural environment. Many of our failures in the past occurred here.

The strategic goal in protecting the natural environment is to halt the continuation of damage to the natural environment by 1990 and initially realize a beneficial cycle between the natural ecology and agricultural ecology by the year 2000 so that renewable resources may attain the goal of perpetual utilization.

We must oppose rash actions on the natural environment and natural resources that ignore the laws of nature and we must also oppose the passive protection of "naturalism." The correct guiding principle is to combine protection and rational utilization.

Protection of land resources. Land is the essential material base man depends on for survival; it is the indispensable means of production for material production and the ground for animal growth and multiplication. Therefore, various rational allocation and utilization of land is critical to social and economic development as well as the protection of the natural environment.

For the protection of land resources, before 1990 we can consider formulating a rational land utilization policy to strengthen the scientific management of land resources, stop the irrational occupation of land particularly cultivated land and reverse the continual damage to land resources caused by soil erosion, desertification and salinization. By the year 2000, land throughout the country particularly land in some economically more developed regions should generally have rational planning, and in agriculture we should combine advances in agricultural techniques, basically achieve using land for agriculture, forestry, animal husbandry and fishing only where conditions are suitable and make the structure of agriculture rational. We should also make major breakthroughs in the treatment and soil improvement of some key areas affected by soil erosion, weathering and desertification, and increase the effectively treated erosion area nationwide from the present 270,000 square kilometers to 900,000 square kilometers. The principal countermeasures are as follows:

First we must do a good job in developing and utilizing territorial resources and their protection planning. The key is to do a good job in regional planning, make rational arrangement for industrial and agricultural production, urban development, construction of communications in mining and specific land used by village and town residents. Achieve rational distribution, use inferior land in place of good land where possible, occupy little or no cultivated land and economize on every inch of land. Land damaged by mining should be reclaimed.

In agriculture, we must do a good job in agricultural development planning, determine the direction of utilization of land resources in accordance with different types of land and their natural conditions, suit measures to local conditions in arranging land use by agriculture, forestry, animal husbandry and fishery so that the structure of agriculture may gradually become rational. In utilizing land we must stress adopting measures to prevent deterioration of agroecological conditions. The key is to protect vegetation, prevent soil erosion and desertification; irrigate rationally and prevent soil salinization; raise soil conserving crops and return straw to the fields and prevent the decrease of organic substances in the soil; develop comprehensive prevention of plant diseases and insect pests, use chemical fertilizer and pesticide rationally and prevent pollution of crops and land. In transforming the agroecological environment, we must stress combining engineering measures and biological measures, implement the guiding principle of suiting measures to local conditions and comprehensive treatment.

Protection of biological resources. Biological resources are the most active factor in the ecosystem, the most important component in the natural environment and the ultimate source of all food for mankind. Protecting biological resources therefore has a special important meaning.

Forests are a principal part of biological resources. Protection of forest resources implies protection of numerous wild animal and plant resources at the same time. China's climatic conditions, particularly hilly areas which constitute a large proportion of China's territory, provide favorable conditions for afforestation, and there is a vast world for forest development in China and much can be accomplished. Our goal can be planned as follows: the rate of afforestation to reach about 20 percent of the total territorial area by the year 2000 and to reach 30 percent or more by the year 2020. To realize this goal, the appearance of China's natural environment must undergo a great or even fundamental change.

To realize the goal mentioned above we must adopt a series of major measures. At present, we must strictly control the volume of cut, firmly correct the imbalanced relationship of greater importance of the volume of cut over the volume of reproduction, stress rational methods of felling and prompt improvement of felling grounds. In particular we must stress building a fast-growing commercial forest base in the south and extensively build fuel forests, and positively solve the fuel needs in the peasants' everyday life. In the north we must stress making plateaus green, build wind-break sand-fixation forests and pay attention to planting trees around large and medium-sized cities in order to improve the environmental quality of cities.

From a long-term standpoint, the emphases in afforesting China are the barren hills and mountains which constitute a large area and the northwest loess plateau which has severe soil erosion. We do not need to wait till later before we afforest these regions but should develop gradually from now. Practice has shown that for many barren hills with suitable water and heat conditions, adopting the method of closing the hillside to facilitate afforestation can bring good results and it takes only a few years for a good forest to appear. Only if we are determined to act, the speed of afforestation can be greatly increased particularly for some hilly areas in the south. In order to speed up the progress of afforestation throughout the country, we can proceed from good to poor conditions and from nearby to distant areas in planting trees. Aerial seeding has proved to be a good method and should be used more often.

Protection of grassland. The area of grassland in China is almost 4,800,000,000 mu of which the usable area is 3,337,000,000 mu. Grassland is an important obstacle to prevent the spread of the desert. It is a major base for animal husbandry and it can provide large amount of animal protein. Natural conditions in grasslands are generally severe but grasslands and desert regions in China have long daylight hours, high annual radiation and strong winds so that they are rich in solar and wind energy resources. Around them are numerous high mountains that rise above the snow

line, such as the Altay Shan, Tian Shan, Kunlun Shan, Altun Shan and Qilian Shan, whose melted snow annually provides the arid grassland and desert large amounts of valuable water resources. These are the highly favorable conditions in developing, constructing and protecting China's grassland. The goal of grassland protection by 1990 can be considered as halting the arbitrary opening up of grassland and damage to desert vegetation. The number of heads of livestock should be controlled in order to reduce overgrazing in the grassland. By the year 2000 the number of heads of livestock in each grazing area should not exceed the livestock capacity in the grassland of that area and deterioration and desertification of grassland should have been basically controlled. Modern science and technology should be used to transform animal husbandry in China so that the total livestock capacity of our northern grassland will increase from the 2,200,000,000 sheep units in 1980 to around 2,700,000,000 sheep units through the improvement and construction of pastures. Large man-made pastures should be built in regions with relatively good natural conditions and used as a base for animal husbandry.

As countermeasures for the protection of grassland, we must combine current measures with long-term measures. Mainly we must correct overgrazing, regulate the right to use pastures, control the number of heads of livestock, popularize raising young stock for fattening and slaughtering in the same year and prevent the further deterioration of grassland. We should positively solve the daily fuel problem of the people in pastoral areas, actively develop fuel forests and new sources of energy such as solar and wind energy. Pastoral areas must be used primarily for grazing and those which are unsuitable for cultivating crops must be replaced by grazing. Arbitrary reclamation and denudation of grassland must be strictly forbidden. Natural forests of grassland and desert vegetation must be protected and we must prevent grassland from desertification. Overall planning for water resources in grassland should be strengthened, distribution of water should be rational and water used for farming should be strictly controlled. We must improve the drainage system in irrigated farm areas and prevent the salinization of soil. Pastures which are short of water but have groundwater should drill wells for irrigation. We should strengthen scientific management, practice seasonal campsites based on 2 or 3 seasons and gradually achieve rotational grazing among the areas. At the same time we should actively build man-made pastures and improve natural pastures and greatly increase the grass output of pastures.

Protection of wildlife and wild plant resources. Wildlife and wild plants are indispensable consumers in the ecosystem; they play a highly important role in protecting the balance of the natural ecology. Wildlife and wild plants can provide us with many important materials for medicine, production and daily life; they are the major resources for livestock breeding and crop varieties and they are also highly valuable for scientific research and ecstatic purposes. China is abundant in wildlife resources, with a total of over 400 animal species, over 1,100 bird species and almost 30,000 higher plant species of which many are rare and precious.

Because we did not understand the importance of these resources in the past we have not paid enough attention to them. On the one hand a great deal of animal and plant resources have been damaged and quite a few rare and precious species are near extinction. On the other hand a great deal of animal and plant resources are yet to be rationally exploited and utilized. For instance, wild plant resources used as materials for starch, fibers, oils, aromatic oil and rubber have a variety utilization rate of only 8 percent; their quantity utilization rate is also low and has potential for development. Our major goal by 1990 is to strengthen management and stop further damage. At the same time we should intensify the survey of animal and plant resources and understand them thoroughly. By the year 2000 we should intensify scientific research and gradually realize artificial breeding and cultivation of near-extinct animals and plants protected by the state and of precious commercial animals and plants. Our guiding principle for the management of wildlife and plant resources is protection, development and rational utilization. There must be planning and control for the gathering and hunting of wildlife and wild plants in general. We must protect beneficial birds and animals and strictly ban the gathering and hunting, buying and selling, procurement and export of rare wildlife and wild plants. We must vigorously introduce fine varieties, domesticate and breed economically valuable animal and plants. Besides, we must conscientiously stress protecting the environment for the survival and habitat of wildlife and wild plants, which is a basic measure to prevent their extinction and damage.

Setting up natural reserves. This is an important measure to protect the natural environment and resources, save the near-extinct biological species, protect the specially precious fossil grounds and geological landscape and monitor the effects of man-made activities on the natural ecology. At present, we should mainly strengthen existing natural reserves, particularly build and manage some key natural reserves and gradually build a number of new ones on this basis. We must pay particular attention to building some natural reserves of grassland, deserts, water areas, marshes, beaches, geological feature and landform. The area of the reserves should be increased from the 0.47 percent of China's land area at present to 2 percent by the year 2000. Different management policies should be adopted for different types of natural reserves and we must treat certain reserves or areas within certain reserves as bases for advanced studies on the ecosystem and provide standard natural "background" for different quarters. These areas should be strictly protected. In some of the reserves or some areas within certain reserves we can adopt the guiding principle of combining protection and rational management to benefit the construction and management of reserves.

9586

CSO: 4008/128

## ENVIRONMENTAL QUALITY

### SCIENTISTS PROPOSE MEASURES FOR ENVIRONMENTAL PROTECTION

Beijing RENMIN RIBAO in Chinese 16 Dec 84 p 1

[Article by Xiao Tihuan [5135 7551 3562]]

[Text] The reform of the economic system has put forth new demands on the environmental protection cause. The scientific research and practical workers in environmental protection must "take the lead in making preparations" instead of "following behind" and strive for a synchronous development between environmental protection and economic construction. This is an important argument put forth by the specialists and scholars in environmental sciences.

The environmental scientists feel that the "Seventh 5-year Plan" of the country has made the technological transformation of old enterprises the focus of construction. Environmental protection is an important project in the technological transformation. While revitalizing the economy, destruction of certain natural resources may occur. For this reason, a basic countermeasure has been proposed to take prevention as the key and combine prevention with treatment; to incur no new debts and pay up old debts; and to effect a benign cycle and bring happiness to people. Specifically, this means:

The environmental sciences must lead production and construction. While making policy-decisions concerning the large-scale production and construction projects, the government organs at various levels and other sectors must invite the participation of specialists in the environmental sciences and respect the opinions they offer. Environmental planning should be carried out simultaneously with economic regional planning and urban planning.

We must strengthen environmental management. We must simplify administration and transfer power to the lower levels in environmental management, must respect the decision-making power of the environmental functional departments themselves, further set up and perfect the environmental legislative and executive systems, and change the condition of power over law and non-compliance with the law.

We must provide fine environmental technological service and strengthen the research and popularization of applied technology. Currently, we must pay

special attention to providing the village and town enterprises, special economic zones and new economic zones with feasible technologies and approaches to pollution prevention and environmental protection.

We must further popularize the knowledge of the environmental sciences among the leading cadres at various levels and the broad masses of people, and enable them to consciously wage struggle against such uncivilized acts as environmental pollution.

9335

CS0: 4008/173

## ENVIRONMENTAL QUALITY

### CHINA'S AGRICULTURAL ENVIRONMENT DISCUSSED

#### National Conference on Agricultural Environment

Beijing ZHONGGUO HUANJING BAO in Chinese 27 Nov 84 p 1

[Article by Li Rongao [2621 2837 2407], Jiang Xuanbin [5592 6693 2430] and Ding Hong [0002 5725]]

[Text] Currently, protecting the ecological environment for agriculture in order to promote the sustained and stable development of agricultural production has become an urgent task for the agricultural and environmental protection sectors in our country. This is a common view held by the participants at the national conference on exchanging experience in the protection of the ecological environment for agriculture, held in Wu County, Jiangsu Province, recently.

Currently, our country's agriculture is undergoing a tremendous change from a self-sufficient and semi-self-sufficient economy to a commodity economy, and from a traditional agriculture to a modern agriculture. A fine ecological environment for agriculture is a basic condition for the realization of these two changes. The comrades attending the conference talked about the varying degrees of destruction of our country's ecological environment for agriculture as a result of the protracted "Leftist" ideological influence. Many regions only paid attention to economic results and neglected environmental results, and undermined our agricultural resources through development in the form of plunder. The increasing number of village and town enterprises has to a certain extent also intensified the pollution of the ecological environment for agriculture. Thus, more and more people have attached importance to and showed concern for establishing and popularizing ecological agriculture and for protecting the ecological environment for agriculture. In recent years, bold explorations have been made in protecting the ecological environment for agriculture, and many experiences have been accumulated accordingly.

In order to exchange experiences in this respect and to enhance the development in depth of the work of protecting the ecological environment for agriculture, the Ministry of Urban and Rural Construction and Environmental Protection and the Ministry of Agriculture, Animal Husbandry and Fishery have jointly convened this conference. Attending the conference were over



250 delegates. Over 160 copies of materials on typical experiences were collected. Xiao Tong [5135 2717], Vice Minister of Urban and Rural Construction and Environmental Protection, and Bian Jiang [6708 3984], advisor to the Ministry of Agriculture, Animal Husbandry and Fishery, delivered important speeches at the opening ceremony (see page 2 for excerpts of the speeches). Ma Shijun [7456 0013 7486], a famous ecologist, Chen Ziyuan [7115 1311 0337] and Shen Hengli [3088 0077 3810], agricultural specialists, delivered academic reports at the conference. Delegates of several advanced units and specialized households also spoke at the conference. Great enthusiasm was aroused among the participants.

In his concluding speech, Sun Jiamian [1327 0857 4875], deputy head of the Environmental Protection Bureau of the Ministry of Urban and Rural Construction and Environmental Protection, affirmed the experiences of various localities in launching the work of protecting the ecological environment for agriculture, and drew up a plan for the work in the future.

#### Editorial on Agricultural Environment

Beijing ZHONGGUO HUANJING BAO in Chinese 27 Nov 84 p 1

[Editorial: "Conscientiously Emphasize the Work of Protecting the Ecological Environment for Agriculture"]

[Text] Currently, our country's agriculture is developing from a self-sufficient and semi-self-sufficient economy to a commodity economy and from a traditional agriculture to a modern agriculture. To realize these two changes, we must have a fine ecological environment for agriculture.

Unlike other forms of economic production, agricultural production relies heavily on the ecological environment. Our country does not have abundant per-capita agricultural resources. Our ecological environment is weighed down by a large population. Many regions have a weak ecological environment which is extremely easily undermined and is unfavorable to agricultural production. Thus, we should painstakingly and rationally utilize our agricultural resources and conscientiously protect and improve our ecological environment for agriculture, and must not permit any carelessness.

However, because many of our comrades have failed to understand this, while making arrangements for agricultural production, some localities, in carrying out specialized contracting, have paid attention only to economic results and neglected environmental results. They have failed to act according to the natural laws. Hence, the destruction of the ecological environment for agriculture has all along been rather serious. The large-scale development of village and town enterprises has brought new problems of pollution to the ecological environment for agriculture. As Premier Zhao Ziyang has pointed out: "The problems which have appeared in the rural areas now are most probably not the problems regarding the system of ownership, but the destruction of the natural environment and the ecological balance." Thus, we are faced with an extremely urgent and important task of strengthening the protection of the ecological environment for agriculture.

In recent years, many modes of developing agricultural production according to the ecological laws have appeared in many localities. These have not only enhanced the development of production, but have also protected the ecological environment for agriculture and unified economic results and environmental results. This is an important approach to realizing modernization in agriculture.

In order to popularize ecological agriculture, we must carry out propaganda in a widespread manner on the scientific knowledge in ecological agriculture. We must take into consideration the local environmental, social, economic and technological factors and actively implement experiments in ecological agriculture in line with local conditions, and make use of models to promote the work in all areas. We must integrate this work closely with the implementation of the party's rural economic policies, and with the work of agricultural regionalization, rural and urban construction and the building of village and town enterprises. We must make overall consideration and unified planning to attain mutual promotion. We must bring into full play the role of science and technology and continuously provide scientific and technological news and all kinds of technological services. The leadership at various levels, especially the leadership at the county and village (town) levels, must understand the important significance of the protection of the ecological environment for agriculture and the development of ecological agriculture on the modernization in agriculture. The agricultural, forestry, water conservancy, commercial, industrial and communications sectors as well as relevant scientific research departments must coordinate with one another and carry out close cooperation in the common struggle to build a fine ecological environment for agriculture.

9335

CSO: 4008/173

## ENVIRONMENTAL QUALITY

### SHAANXI PARTY SECRETARY ON FURTHERING ENVIRONMENTAL PROTECTION

HK141510 Xian SHAANXI RIBAO in Chinese 30 Jan 85 p 1

[Report by Correspondents Xiao Jiansheng [5135 0494 5116] and Zhang Dachang [1728 1129 2490] and reporter Qi Wenbing [7871 2429 3521]: "Provincial CPC Committee Secretary Bai Jinian Listens to Briefing About Environmental Pollution and Speaks About Work in This Respect"]

[Text] "Environmental protection is a new cause. It affects the coming generations. The people of the whole province should jointly strive to build our province into an economically prosperous paradise with a beautiful environment!" This is the demand imposed on the province not long ago by Comrade Bai Jinian, secretary of the provincial CPC Committee, after he listened to the investigation reports presented by the departments concerned on Yanan's pollution problems.

In recent years in Yanan, air pollution has become a very serious problem. Comrade Hu Yaobang has written instructions on the reports and materials on Yanan's pollution problems. In order to implement Comrade Yaobang's instructions, the National Environmental Protection Administration [as published], the provincial construction office, Yanan Prefecture, and Yanan City have jointly formed a joint investigation group to inquire into the state of Yanan's environmental pollution and to recommend prevention and improvement measures. On 16 December last year, Comrade Bai Jinian heard a report presented by the investigation group in Yanan and put forward important suggestions on the task of protecting the environment to be undertaken by both the province and Yanan. He said: In the past we paid attention to production but overlooked environmental protection. Consequently, we have wasted some efforts. Now, leaders at all levels should pay close attention to environmental protection. Each year they should pay attention to some specific problems until they are satisfactorily solved. In the past, in launching new projects, some localities failed to solve the pollution problem at the same time. Consequently, the problem of environmental pollution has become increasingly serious. I have visited the United States and Japan. In the United States, the chimneys do not spew black smoke. In Japan, the air is quite fresh. Their main sources of energy are oil, electricity, and natural gas. In our province, our major source of energy is coal. From now on, in launching new projects, it is necessary to "do three things simultaneously." Planning committees and construction departments at all levels should pay

sepcial attention to this. Not long ago our province held talks on international economic and technological cooperation and signed contracts for more than 100 projects, including the building of guesthouses and hotels. The amount of coal consumed by a single hotel is more or less the same of that consumed by an industrial plant. It is necessary to simultaneously solve the problem of pollution. The township and town enterprises should also have comprehensive plans and make rational arrangements. We should, on the basis of the locally available resources, our own technological capabilities, and the environmental conditions, suit measures to local conditions and develop those industries which produce few or even no pollution problems in order to maintain the ecological balance.

During the "Seventh 5-Year Plan" period, the state will give first priority to the technical transformation of the old enterprises. In addition to transforming the old enterprises, we should also perfect the anti-pollution projects. In addition to checking the transformed enterprises, we should also check the environmental protection projects at the same time. Yanan should increase the facilities for reducing smoke and dust in order to make the atmosphere less polluted. It is necessary to speed up construction in the Yanchang Oilfield. The refineries should first of all ensure the supply of liquefied petroleum gas to Yanan's residents.

In order to make the work a further success, it is necessary to strengthen the organs responsible for environmental protection and to train people to be specialized in environmental protection.

CSO: 4008/245

## ENVIRONMENTAL QUALITY

### ENVIRONMENTAL MANAGEMENT IN CHINA DISCUSSED

Beijing ZHONGGUO HUANJING KEXUE [ENVIRONMENTAL SCIENCES IN CHINA] in Chinese  
No 6, 21 Dec 84 pp 2-8

[Article by Jiao Jinhu [3542 6855 5706] of the Bureau of Environmental Protection of the Ministry of Urban and Rural Construction and Environmental Protection: "Some Views on Environmental Management in China"]

[Text] In mankind's common economic activities, economic management comes into being as a result of the objective demand to satisfy the social division of labor and cooperation. With the development of the social productive forces (in particular when we reach the stage of the capitalist economy), it has experienced a shift from spontaneous management to conscious management, and from empirical management to scientific management. At present, taking the science of management and the theories of the behavioral sciences as the mainstay, it has gradually become a study in modern management that comprehensively utilizes modern science and technology as well as management measures. At present, there are all kinds of management theories in the world. However, most of them study management techniques and methods in a narrow sense. Economic management basically still implies the entire process of decision making, planning, organization, command, readjustment and supervision which the management personnel implement for a specific purpose in our socioeconomic activities. Environment (here, as well as below, we refer to the natural environment which mankind depends on for survival) and economic activities are inseparable. Environment has become an indispensable material resource in mankind's socioeconomic development. Thus, environmental management is necessarily a component part of economic management. We should also be able to recognize that the cause of environmental protection permeates the various undertakings, regions and economic units of the national economy. The tasks which it shoulders in the entire national economy are far more widespread and complex than any other independent economic sector. The environment not only provides the resources and energy for production and the commodities and labor service for direct consumption in man's livelihood, it also must accommodate and purify the waste and discarded materials which are discharged through the process of production and livelihood. This has thus determined the special position and role of environmental protection in the management of the national economy.

Environmental management comes into being and develops under the historical condition when the rapid growth of the population, the economy and the

consumption of natural resources, in particular the development by leaps and bounds of modern industry, has seriously polluted and undermined the natural environment. In the process of developing and utilizing natural resources and preventing environmental destruction and pollution, mankind has gradually realized that, without a scientific and effective management of the environment, the balance between "mankind--the environment" will be upset.

This not only will seriously hinder economic and social development, but will also endanger the happiness and safety of man's life. Since the 1960's, in light of the widespread environmental pollution in the economically-developed capitalist countries of the west, environmental management emerged as the times required, but existed only in a passive state in its initial stage. In 1974, the United Nations Environmental Protection Agency (UNEP) and the United Nations Conference on Trade and Development (UNCTAD) jointly convened "A Special-topic Seminar on the Strategic Principles Involving the Environment and Development of The Utilization of Resources," clearly proposing that environmental management is a method for realizing "the two goals of fulfilling all the basic needs of mankind while not exceeding the outside limit of the degree of tolerance of the biosphere"--a rather scientific macroscopic definition. Since the 1970's, the economically-developed countries of the west have begun to pay attention not only to solving the environmental issues through scientific and technological development, but also to strengthening environmental management by means of the method of environmental system engineering, the formulation of programs and economic and legal measures. As a result, these countries have gradually raised their standards of environmental management and brought about a relatively obvious improvement in the environmental quality.

Since 1973, China has set up environmental protection agencies to launch large-scale environmental protection work. In a certain sense, this was the beginning of an all-round environmental management in China, except that we overemphasized simple administrative management in the beginning and failed to consciously attach importance to a systematic and scientific environmental management. In March 1979, on the basis of summing up the positive and negative experiences in environmental management at home, we formally proposed the principle of "strengthening management and letting management promote administration" at the National Conference on Environmental Protection Work held in Chengdu. In February 1980, at the National Conference on Academic Exchanges Involving Environmental Protection, Environmental Economics and Environmental Law, convened in Taiyuan, specialists from all fields unanimously put forth an appeal to "put environmental management in the foremost position of importance in environmental protection." These instances have clearly indicated a new leap in China's understanding of environmental management. In just a few years, whether in the implementation of policies concerning environmental management or in the research on management theories, progress has been made. In particular, at the "Second National Conference on Environmental Protection," convened in December 1983, we have summed up our experiences in environmental management, decided that one basic principle in environmental protection work is to strengthen the scientific management over environmental protection work, and proposed that our environmental management "must not only satisfy the basic requirements for the environmental quality,

but must also conform to our country's situation and take into consideration our country's economic level." This conference will have profound influence on the environmental management in our country.

Environmental pollution and the destruction of the natural ecology are directly related to the development of social productive forces. On the one hand, they are the products of modern industrialization. On the other hand, they are also the products of low-level productive forces. However, in essence, environmental problems are not determined by the productive forces but by the relations of production. Marx once prophesized that: "Socialized men, and producers who have united, will rationally regulate the material alteration between themselves and nature, and put nature under their common control instead of letting the blind force of nature rule over them." ("Das Kapital," Vol 3, "Collected Works of Marx and Engels," Vol 25, pp 926-927) Our socialist system has provided the possibility for an all-round and thorough solution to our environmental problems. Nevertheless, our practice in environmental protection work for more than 10 years has clearly indicated that, to turn this possibility into a reality, the fundamental approach lies in strengthening environmental management. Only by strengthening environmental management can we eliminate the causes for the destruction of the natural ecology and for environmental pollution; only by taking preventive measures can we promote and consolidate the results of the comprehensive prevention and treatment of environmental pollution and destruction.

With a rather late start and a poor foundation, our environmental protection work is far from being suitable for solving the urgent environmental issues. Although the issue of environmental management has begun to draw attention from various aspects, yet, a complete and unified understanding of the issue has not been attained and a systematic research on its basic theories has not yet been launched. The following are some personal views on several major issues in the environmental management in our country:

#### I. Our Task and Goal in Environmental Management

China is a socialist country. Environmental protection has been fixed as a basic national policy. Thus, our general task and goal in environmental management should conform to the demands of the purpose of socialist production. Representing the interests and wishes of all people, the state should carry out scientific decision making, organization, readjustment and control over the two important socioeconomic issues involving the rational development and utilization of the natural environment and the protection of the environmental quality for people's survival and development, so as to enable economic development and environmental protection to advance in harmony.

In terms of development, the entire natural environment constitutes our resources. Environmental management means a scientific management of our natural resources. This involves the correct handling of the dual nature of bringing into full play the function of satisfying the people's needs on the one hand and suppressing the negative role of pollution and destruction of ecological balance on the other. This is represented by the formula for R, the coefficient in the utilization of natural resources, which Suo-ke-luo-fu-si-ji

[phonetic] proposed at the First Soviet-U.S. Discussion on Environmental Economics in October 1977:

$$R = \frac{\sum_{i=1}^n i_1, i_2, i_3, \dots, i_n}{\sum_{l=1}^m l_1, l_2, l_3, \dots, l_m} \leq 1$$

In this formula,  $i_1, i_2, i_3, \dots, i_n$  -- represents the products obtained in the process of production

$l_1, l_2, l_3, \dots, l_m$  -- represents the consumption of resources by production

The limit of value of  $R$  is 1, which is the ideal state of no wastes in the process of production. The goal to attain in environmental management is naturally

$$R \rightarrow 1.$$

From the standpoint of the national economy, the protection of natural resources involves practicing economy over and utilizing the resources which cannot be renewed and restoring and expanding reproduction (permanent and continuous utilization) of the resources which can be renewed. This includes the management involving the exploration of the resources which have not yet been developed, the protection of the resources which are being developed and the rational utilization of the resources which are obtained. From the enterprise standpoint, we must carry out comprehensive utilization of natural resources in the process of production, do our best to fully utilize the resources and prevent environmental pollution as a result of waste and loss. Currently, our major problem in the management of resources is the irrational use and waste of resources (particularly such basic resources as water, air, soil and energy). This not only constitutes the basic reason for the pollution and destruction of the natural environment, but also involves the risk of "exhausting" our natural resources (particularly with regard to the resources which cannot be renewed--including the extinction of animal and plant species).

The so-called environmental quality management proceeds from coordinating the relationship between environmental protection and economic development, so that, while developing the economy, we also guarantee a level of environmental quality that is necessary for the survival, health and development of our people. In environmental quality management, we must, on the basis of a series of environmental quality assessment, including investigation, forecast, monitoring and analysis and study of a certain designated area, propose management and control programs involving technological, economic and legal aspects for that area, and implement these programs accordingly.



The management of natural resources and environmental quality management promote, restrict and complement each other, and are both indispensable. In terms of cause and effect, the management of natural resources constitutes the basic task of environmental management.

Our goal in environmental management is an important basis for our activities in environmental management. It not only is the point of departure for the activities in environmental management, but is also the terminal point which the activities in environmental management point to as well as the result which these activities aim at attaining. Our goal in environmental management should include the following: 1) Aim for the synchronous advance of environmental protection and economic development; 2) aim for the mutual adaptability of environmental protection and social development; 3) aim for the development of environmental science and technology; and 4) aim for the continuous perfection of the mechanism of environmental management itself.

Environmental standards are the technological basis for realizing our goal in environmental management as well as the only measurement for our environmental quality. Because the environment is the sum total of all factors in nature and society, it is a multifactorial, multilevel, heterogeneous, pluralistic, complex and comprehensive system. Environmental pollution often results from diverse channels and multiple factors. This determines the extensiveness and complexity of the environmental standards. Thus, on the basis of studying and determining the pollution-tolerance criteria of mankind and other organisms, the base value of the environment and the environmental capacity, it is extremely necessary to set up our own set of environmental criteria that has diverse forms and diverse contents, including the criteria for environmental quality, and the criteria for industrial and local pollution discharge, taking the criteria of the local environment as the key. In formulating the environmental criteria, we must not only have long-term strategic goals, but must also consider our realistic economic situation and our technological factors in order to correctly solve the contradiction between need and possibility and proceed in an orderly way and step by step the improvement of our environmental quality.

## II. Our Form and Approach in Environmental Management

Management of any kind must involve the organization, system, measure and method of management. In light of our practical experience and our country's situation, we must, first of all, fix the strategic steps and strategic focus in environmental management. Second, we must formulate specific long-term programs and fiscal plans for environmental protection. Third, we must formulate the principles, policies, measures, laws and regulations, and methods that are suitable to the characteristics of the socialist economic system and to the objective economic laws. Fourth, we must set up a powerful and highly efficient management system that corresponds to our management tasks and that integrates the central and local authorities with emphasis on the latter, and carry out command and coordination accordingly. Fifth, we must carry out propaganda and education, and mobilize and organize the masses to get involved in environmental management.

Environmental management can be carried out at different levels:

Specialized environmental management--Primarily involves the formulation of nationwide environmental management policies, environmental programs, environmental laws and regulations (including standards) and environmental principles and policies; the collection, analysis, forecast, study and control of the environmental quality throughout the country; and guidance in the environmental protection work throughout the country. This is the responsibility of the state organ in charge of environmental protection.

Regional environmental management--Primarily involves specialized regional environmental management and the comprehensive prevention and treatment of regional environmental pollution. This is the responsibility of the local organ in charge of environmental protection.

Industrial environmental management--Primarily involves regular management work in integration with the control of pollution sources from the building, expansion and technological transformation of enterprises. This is the responsibility of the central and local organs in charge of industry as well as enterprise and professional units.

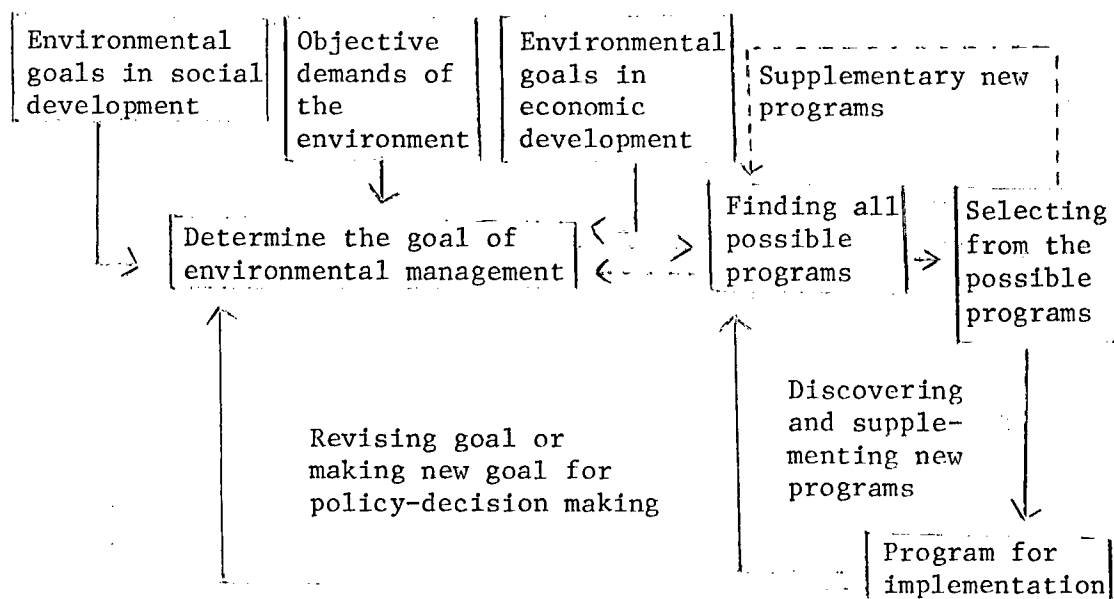
Management of resources--Primarily involves the rational development and utilization of the land, resources and energy, as well as the protection of animals and vegetation and the natural landscape. The state organ in charge of environmental protection takes the lead in and coordinates with concerned departments of the state in the work.

Scientific and technological management--Primarily involves management in the planning for the development of the environmental sciences, the development of technology, the breakthroughs in scientific research, the results of scientific research, as well as such factors as planning, personnel and scientific research. The scientific committees at various levels take the lead in the work in coordination with the environmental management departments, the Chinese Academy of Sciences, the Chinese Academy of Social Sciences, institutions of higher learning and the departments in charge of various industries.

The specific measures which we should adopt in environmental management include roughly the following:

A. Policy-decision management. Policy-decision is the precursor of action and is the most important measure and form of management. All processes and activities of environmental management and the implementation and elaboration of the functions of environmental management cannot do without environmental policy-decisions. The environmental management personnel at various levels, in particular, the leading personnel, are often faced with the task of decision making of all kinds. The basic theory and method of decision making in economic management are entirely appropriate for use in environmental management, except that the factors affecting environmental policy-decisions are more extensive and complex. On both the macroscopic and microscopic scale, the process of environmental policy-decision should include generally the

following three steps: 1) Determining the site of the problem and propose policy-decision targets; 2) discovering, exploring and drafting all kinds of possible programs for action; and 3) selecting the most appropriate one from all possible programs. The process of policy-decision making is a repeated dynamic process of "policy-decision making--implementation--policy-decision making again--implementation again," as shown in the following diagram:



(The dotted lines indicate feedback)

In policy-decision management, we must pay attention to emphasizing the following: Our goals should be rational; the results of our policy-decisions should satisfy the demands of the estimated goals; and the process of policy-decision making itself should conform to the principle of efficiency and of economics.

B. Management of Policies and Laws and Regulations. Environmental policies are the point of departure and end-result of all environmental protection activities, and are the criteria for environmental protection work. The formulation and implementation of environmental policies are important tasks in environmental management, which we must attach great importance to. Our country's environmental policies should be the summary of the principles and lines of work and the various countermeasures which the party and government formulate and implement in protecting and improving the environment in line with the Marxist theory and in light of our economic and social realities. The environmental policies can be divided into general policies, basic policies and specific policies; into policies at the central level and local policies; and into policies involving protection of air, water, soil and forests....

Laws and regulations are especially important in environmental policy management. Environmental laws and regulations are the norms and criteria issued and the arbitrary measures adopted by the state and local authorities through

legislation in an attempt to intervene with acts that are harmful to the environment. They are the guarantee for all kinds of measures in environmental management. At present, environmental protection laws and regulations are being issued one after another. In the future, besides further improving and systematizing the legislature, we must set up and perfect a corresponding judicial system in order to bring into play the effective role of laws and regulations in environmental management.

C. Administrative management. This refers to administrative work involving environmental management assumed by the government environmental protection agencies at various levels (particularly the government of the central cities). Generally, this involves the use of administrative decrees, public notices, quota, regulations, the formulation of plans, and the transmission of command-style plans to the lower level, and involves regulating, controlling, protecting and improving the environment according to administrative system, level and regional division. It embodies arbitrary and legal characteristics by relying on government authority in giving direct command to the lower level in accomplishing the tasks of environmental protection.

Setting up and perfecting the various categories of environmental protection agencies, strengthening the building of the environmental protection rank and supporting the environmental protection cause economically and technologically constitute the basic guarantee in implementing administrative management. The state and local government at all levels should attach importance to this matter.

D. Management by economic methods. This means adopting economic measures, that is, utilizing such economic levers as prices, profits, loans, interests, taxation and fees, to influence the people's activities of polluting or protecting the environment. The core to using economic methods in management is to utilize the law of values and implement the principle of economic interests in supporting and rewarding those who protect the environment with funds and in imposing fines on and collecting pollutant-disposal fees from those who pollute and destroy the environment. Practice has proved that this is an effective measure in raising the level of environmental management and is a necessary approach in environmental protection in accordance with the objective economic law.

E. Management in ideological education. Under certain circumstances, progressive thinking and revolutionary spirit play a tremendously dynamic role in transforming the objective world. Because environmental protection concerns the interests of all people and later generations, it is the responsibility of all. Thus, the socialist environment management should attach great importance to the management in ideological education. We should vigorously carry out propaganda and education among the people, understand that building a safe, healthy and fine environment is an important symbol of a socialist material civilization and spiritual civilization, comprehend and master the principles, policies and laws and regulations of the state in environmental protection, popularize the scientific and general knowledge in environmental protection, and attain the goal of environmental management by all people.

Furthermore, we should be able to realize that management is both a science and an art. Thus, conscientiously summing up, through practice, the logic and method of a leading theory and the model of the art of management and implementing them in actual management work are the indispensable measures in carrying out environmental management and the important methods in raising the level of environmental management. We should conscientiously study the relevant issues and the application of the theories in the behavioral sciences in socialist environmental management. But these aspects will not be discussed in detail here due to limited space.

### III. The Question of How To Raise the Level of Our Environmental Management

The level--high or low--of environmental management directly affects the results of our environmental protection, and also restricts our economic and social development. Thus, in light of the demand to carry out overall reform of our economic system and the four modernizations, an urgent task put before our environmental management personnel is to raise the efficiency in environmental management as quickly as possible. In light of our present reality in environmental management, I feel that we should first of all solve the following two problems:

A. Study and establish a field of socialist environmental management that conforms to our country's situation. The field of environmental management is a newly-rising branch of study that is developing in the world. The theories of environmental management in our country is at a rudimentary stage. They are still very immature and incomplete. A powerful rank has not yet been organized to study and apply the set of theories and methods of socialist environmental management that conforms to our country's situation. This no doubt makes it impossible for us to solve some of the theories and actual problems that appear in environmental management, and constitutes a serious drawback in effectively protecting our natural resources and controlling environmental pollution.

The task of studying and establishing a science of environmental management in our country is a cumbersome one. But, in terms of guiding ideology, we should clarify the following questions of principle.

1. We must let the socialist economic and political system decide. In "Das Kapital," Marx has repeatedly elucidated the dual principle of management. This principle not only has exposed the essence of capitalist production management, but has also exposed the general principle of economic management. Environmental management naturally is no exception. On the one hand, the natural attributes of environmental management do not present distinctions in essence at different social historical stages and under different social systems. We can, in integration with our country's situation, fully analyze, study and borrow some good experiences and methods accumulated by the western advanced capitalist countries. On the other hand, the social attributes of environmental management present distinctions in essence between socialist environmental management and capitalist environmental management. Different economic and political systems, different production purposes and different socioeconomic and technological factors will determine the fact that people

will adopt different attitudes and different methods of management over environmental issues. Thus, the theories of the science of environmental management that are suitable to our country must be founded in integration with our country's situation.

2. We must abide by the objective law of the socialist economy. That socialism practices a planned commodity economy is an objective demand of the socialist system of public ownership and social mass production. If we do not revolve around such an economic characteristic in carrying out management in environmental protection, then we will affect and undermine the normal active role of the socialist system of public ownership as well as its consolidation and development. Only by including environmental management into the socialist planned management in adherence to the law of the commodity economy can we guarantee the realization of the development of the national economy in a planned and proportionate manner.

3. We must recognize the complexity of the socialist economy. Under the socialist system, the extent of the role of management and the scale of the system of management are both expanded. Because the national economy is a complex network, it involves not only the various important factors of production and the various aspects of the relations of production, but also involves certain links of the superstructure. It is related not only to the various sectors and regions, but also to the various economic units and the masses of people. At present, our country is carrying out an all-round reform of the economic system. Various categories of economic activities will become more vigorous. Many new situations and problems will definitely appear. Under such a circumstance, it is even more necessary to ask the whole country to unify understanding in order to flexibly organize activities in environmental management.

In accordance with the above-mentioned principles, we must make use of the Marxist political economy, the economics of the productive forces and the basic principles of dialectic materialism and historical materialism to study and create a science of socialist environmental management. This involves studying the internal essential relationships such as the reciprocal influence and link, restriction and integration between environmental protection on the one hand and the national economic activities on the other and among the various sectors, regions and economic units, and the masses of people, exposing the movement and general laws of development, expounding the reasons for managing such environmental issues as environmental pollution and ecological destruction, and formulating the basic principles, functions, tasks and methods of the government in environmental management, in order to guide the work of environmental management, raise the scientific level of environmental management and the comprehensive results of society, and promote the development of the socialist construction.

B. Apply modern management techniques on a popular scale. With the continuous progress in science and technology, our country is faced with the challenge of a worldwide new technological revolution. Our national economy is developing rapidly, the scale and category of our social production are continually expanding, society's division of labor and link are becoming

increasingly meticulous, and the factors affecting the environment are becoming more complex and changeable. All these have led to the sharp increase in the volume of news and work in environmental management, the sharp complication of the content of management, the unprecedented expansion of the scope of management, and a greater prominence in the important role of environmental management. In light of this situation, besides conscientiously summing up and improving all kinds of effective management techniques, we must also apply the modern management techniques that fits our country's situation.

In light of the actual level and scientific and technological factors of the present environmental management in our country, I feel that we should emphasize the development of the following management techniques:

1. System engineering. Utilizing the mathematical method, we can carry out overall analysis on the environmental system, and set up a concept of viewing the situation as a whole, an overall point of view and a comprehensive point of view regarding environmental protection and economic development, so as to attain the best design, control and management of the complex interrelationship between environmental protection and economic development and between the environmental system and subsystem. This will enable the environmental management personnel to change their mode of thinking from emphasizing the method of analyzing individual environment to emphasizing the comprehensive method of system analysis. Currently, the most urgent need is to utilize systems engineering technology to realize environmental planning, the comprehensive prevention and treatment of environmental pollution, and the optimization of our environmental standards.

2. The mathematical method. We must apply operational research (the theory of planning, the game theory, the decision theory, the queuing theory, and the search theory) and apply statistics (the theory of probability, mathematical statistics and correlation analysis) in breadth and in depth, and introduce the matrix and the optimum theory into environmental management. This will enable the people to quantify the extent of reciprocal influence and restrictions among the environmental factors, and therefore to forecast the trend of development of the environment and expose new phenomena and new relationships in the environment. We must pay attention to the application of ambiguous mathematics in environmental management. Through a large volume of all kinds of environmental quantitative and qualitative research, we can establish different mathematical modes as the scientific basis for the assessment and control of environmental quality.

3. Simulation technique. This is an experimental method of studying the environmental system in environmental management and scientific research which is popularly adopted abroad. Its basic principle is to link together metrically the major variables, constraints and validity in the many repetitions in order to explain the interrelationships among the various factors observed in the process of environmental management. According to its degree of abstraction, the environmental model can be a pictographic model, a simulation model or symbolic (or mathematical) model. A pictographic model is a miniature of the real environment. In the laboratory, one can construct a

real or simplified concrete model which can be handled by the existing measures. After readjusting the input variables, one can use apparatuses to observe the output variables or the responses of the various parameters. In this way, people will be able to understand the laws of the migration of pollutants as well as the self-purification capability and regulation and control of environmental quality in a real environmental system. This method is extremely suitable for studying the management of a designated environment (such as the air composition and changes in the sky above a river or an area) and the efficiency of pollution devices. The simulation model uses one set of parameters to represent another set of parameters, or uses the flow volume of fluid and the flow volume of electrical current to simulate an environmental system. The analogue computer, on the other hand, constructs a relationship between certain variables in an environment and the electronic system. The simulation model and the symbolic model adopt the simulation method when a realistic model is not necessary or cannot be constructed. The environmental mathematical model uses mathematical forms to represent the variables in an environment as well as the relationship between these variables and the goals of environmental management. Although more difficult to construct, this model has very high degree of abstraction and accuracy in practical application. The mathematical model and simulation model embody greater universality, and are suitable for studying dynamic situations. Thus, they can be used in repetitive and conventional environmental management and environmental forecast or control. At present, we should especially construct mathematical or simulation models in the ecological system, in the system involving the utilization of resources, socioeconomic development and environmental protection, in regional environmental quality assessment, forecast and control, in environmental standards and economic compensation, in the analysis of the results of investment in pollution treatment, and in the analysis of the harm and benefit of construction engineering on the environment.

4. The technology of information handling. It is becoming increasingly obvious to us that the modern society is a society when information is handled with high speed. In any type of management, we cannot move an inch when we are divorced from information. Information, not material elements, constitutes the raw materials and finished products of the labor of the management personnel. Here we can see that the management personnel are the recipients, processors and transmitters of information. Thus, in management activities, we must abide by the laws of the movement of information and the management of information. We should bring into full play the role of the information system in environmental management and set up an information system for environmental management. This means an information system composed of men and machine (the computer and so forth), which will collect, process and transmit a large quantity of environmental information, and utilize the information in carrying out forecast, control and management decision-making. At present, we should first of all lay a good foundation by further improving the environmental information and materials network, the environmental statistical work network and the environmental quality monitoring network, equip ourselves with advanced technological measures, and link up the computer center with the planning commission, economic commission and scientific commission, so as to ensure the smooth and timely transmission of



an adequate and suitable quantity of reliable and complete environmental information.

5. Computer technology. In modern management technology, the mathematical tool is basically used. The simulation technique uses mathematics as the basis, and system engineering also uses the mathematical model as the basis. Only by having the computer can modern management technology manifest its strength. Thus, the widespread application of the computer is a basic guarantee and important symbol of the use of modern management technology in environmental management. At present, we must solve the following problems in the application of computer technology in the environmental management throughout the country: We must set up an environmental computer center, which will first of all satisfy the needs of the information system in environmental management. We must strengthen computer management, vigorously develop our software technology and make a breakthrough in the technology of using the computer in all-round environmental management. We must use micro-computers on a widespread scale. We must advocate "using one machine for multiple purposes" and "sharing machines" by linking up the computer with the terminals by means of communication lines, thereby forming a computer network and realizing the sharing of resources. If we do not have adequate manpower and fund, we can first carry out the basic work of computer management, arrange the information process, popularize computer education and do a good job of building up a technological reserve.

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## ENVIRONMENTAL QUALITY

### ENVIRONMENTAL IMPACT OF SHUIKOU HYDROELECTRIC STATION ANALYZED

Changchun DILI KEXUE [SCIENTIA GEOGRAPHICA SINICA] in Chinese No 2, Jun 84  
pp 151-157

[Article by Yu Zezhong [0151 3419 1813], Geography Department, Fujian Normal University: "Prediction on the Impact of Building the Shuikou Hydroelectric Station on the Ecological Environment of the Middle-Lower Reaches of the Min River"\*)]

[Text] The Shuikou Hydroelectric Station of the Min Jiang is the largest hydroelectric station planned for Eastern China. The installed capacity is 1.4 million KW, and the planned annual generation of electricity will be 4,950 million KWh. To what extent will the construction of this hydroelectric station affect the ecological environment of the middle-lower reaches of the Jiang Min? Studies are made on the following public concerned issues.

#### I. Impact on the Lower Reaches of the Min Jiang

##### A. Possible Impact on the Farmland Irrigation of the Changle Plain

Some comrades believe that "based on the design data, after the completion of the hydroelectric station, the discharge of low water will be raised by 300 cubic meters per second. First, there will be changes in the balance between the salt and fresh waters, and this will affect the farmland irrigation of the Changle Plain that relies on fresh tidal water. The variability in the flow

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\*References were made on the "Research Report on the Environmental Impact of the Construction of Shuikou Hydroelectric Station," and the "Research Report Concerning the Effect of the Construction of the Shuikou Hydroelectric Station on the Fishery and Agriculture of the Lower Min" by the Hydroelectric Section, Huadong Survey Designing Institute, and the interior data were obtained from the units of the Waterways Dredging Office of the Traffic Department of Fujian Province, Provincial Navigation Control Bureau, Waterways Brigade of the Navigation Control Bureau, etc.

of water cannot ensure the need for the growth of crops."<sup>1</sup> I believe that based on the design, after the construction of the Shuikou hydroelectric station, the flow of low water will be raised by 308 cubic meters per second, thus further facilitating farmland irrigation of the Changle Plain which actually relies on fresh tidewater. The reasons are as follows:

Before construction of the station, the discharge of low water along the lower reaches of the Jiang Min during the low water period was variable: the largest low water flow during the low water period was 1,200 cubic meters per second (Zhuqi Hydrologic Station, same as below), and the smallest was only 196 cubic meters per second (3 August 1971). The range was much larger than the expected discharge of low water after construction of the station. The changes in the balance between the salt and fresh waters of the tidal section of the lower reaches of the Min Jiang, under similar tidal ebb and flood action, were determined by the discharge of low water: when there was more low water flow, the boundary between the salt and fresh waters would move downward. On the contrary, it moved upward. Even when the discharge of low water in the lower reaches was extraordinary small (under 250 cubic meters per second) and during the coincidence of high tides and flood tides, the fresh water retrogressed upstream from Min'an Town (10 km upstream from Mawei). For example, during high tides and flood tides, the highest salinity of Min'an Town was only 0.57 per 1,000, but the highest salinity of Mawei Port was no more than 0.12 per 1,000 (Baiyan Pool, same as below).

After construction of the station and as the low water flow increased to 308 cubic meters per second, the retrogression of fresh waters took place; because such low water flow definitely will not reverse the original regular pattern of the tidal movement of the retrogressive section. For example, when the discharge of low water is around 300 cubic meters per second, the general tide range between the medium and small tides at Mawei Part is 3 to 4 meters. Its tidal section can be traced 16-20 km upstream from Mawei. The tide range of high tides generally is 4.5 to 5 meters. The currents of flood tides can reach the river surface around Houguan (32.6 km downstream from Mawei).

It is thus obvious that after construction of the station, there are two regular and distinct reciprocal flows of fresh water brought by the flood and ebb tides twice a day in the area around Mawei Port. Before and after construction of the station, this river section's tide range is the largest of the basin. Mawei Port is situated at the river section which is the largest, the widest and the deepest of the Fuzhou Basin. As a result, this river section experiences the largest tide range and admits the largest amount of fresh water in the basin. Thus, during the low water period, there is not much difference between the flow of water brought by the high tides and the flood discharge during the flood period. For example, in the past 30 years, the highest peak flow of the Min Jiang was 29,400 cubic meters per second on 19 June 1968 (24 May was neap tide). On the same day, the highest tidal level (or flood level)

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1 Zhao Zhaobing [6392 2507 3521], "Views on the Construction of the Shuikou Hydroelectric Station of Fujian" [QINGKUANG FANYING], Vol 2, Fujian, Science and Technological Information Institute, 29 May 81 (the following quotations are the same).

at Mawei Port was 5.51 meters. During the low water period and when the low water flow was about 300 cubic meters per second, the highest tidal level of the spring tide could reach or exceed 5.5 meters and the highest tidal level of the neap tide could reach 4 meters. It is thus obvious that after construction of the station, the area around Mawei Port still receives copious fresh water brought by the tides during the low water period. Therefore, the viewpoint that "after construction of the dam at Shuikou, the water discharge of the lower reaches obviously decreases" does not accord with the facts. Since there is an increase in the smallest low water flow, the issue that the decrease in the fresh water flow will affect the industrial and agricultural output and the people's livelihood of the lower reaches does not verify. The retrogression of sea tides will not be intensified, and the salinization of soil will not be formed in the estuary section of Fuzhou Basin.

In addition, after construction of the station, the low water flow has not only increased compared with the smallest low water flow before construction of the station, but has tended to be more regular. It has been pointed out in the design of the hydroelectric station that the Shuikou hydroelectric station regulates the peaks during the low water period; the water discharge is not regular at the hydroelectric station in a day, but due to the regulating and storage functions of the river trough, the river channels of the lower reaches will become more evenly distributed. Based on irregular calculations of the daily regulation of the lower reaches of the Shuikou hydroelectric station, downstream from Zhuqi (44.7 km downstream from Mawei Port), the flow has been well distributed. It is obvious that on the basis of the well distributed flow during the low water period, the daily periodical retrogression of tidal fresh waters of Mawei Port and its upstream river section, which are under the effect of the tidal currents, will be more regular and stable. The phenomenon is incomparable to that before construction of the station.

The farmland irrigation of the Changle Plain mainly relies on the fresh water brought by the tides around Mawei Port. After construction of the station and during the low water period, because there is a more regular and stable tidal movement which mixes with the increasing low waters, the salinity of the fresh waters brought by the tides will be even lower, and the changes will be even less. In this case, it is beneficial for the farmland irrigation of the Changle Plain, ensuring the need for crop growth.

Additionally, irrigation of the largest sandspit plain of Langqi Island at the mouth of the Min Jiang, the recently extended plain and the farmland which originally relies on tidal water irrigation, will be ensured after construction of the station.

#### B. Will It Affect the Supply of Sludge Manure to the Farms of the Fuzhou Basin?

Some comrades believe, "After the water of the Min Jiang has been blocked by the big dam at Shuikou..., most of the silt, minerals and organic matter in the waters of the Min Jiang will deposit underneath the reservoir. Therefore, the water outside the Shuikou dam will become clear because the water is discharged

regularly for the daily generation of hydroelectric power, and the extraordinary serious floods will not break out in the lower reaches of the Min Jiang during the flood period.... It will have adverse effects on the 500 square km network of waterways of Fuzhou Basin...."<sup>1</sup> They also believe, "The source of manure for the 440,000 mu of farms of the Fuzhou Basin mainly comes from the Min Jiang. The silting at the port and river mouth is caused by the ebb and flow tidal movement; it is a highly effective manure which can improve the soil and enhance soil fertility. After the Shuikou hydroelectric station is completed, the water discharged will be cleaner and will contain less organic matter. Therefore, there will be problem in the source of manure for the farms in Fuzhou Basin, and will affect agricultural production."

I believe that the water discharged from the Min Jiang during the flood period after completion of the station will not be cleaner; it will be the same as that before construction of the station. Because according to the design, the annual amount of runoff at the dam site of the Shuikou hydroelectric station averages 54.5 billion cubic meters, but the capacity of the regulating reservoir is only 700 million cubic meters, which is equivalent to 1.28 percent of the annual flow of runoff. The operation of the hydroelectric station during the flood period belongs to runoff type. Since the capacity of the reservoir is very small, the amount of water brought by the floods will be discharged. The reservoir does not prevent floods from discharging to the lower reaches. Therefore, most of the silt will be discharged to the lower reaches, bringing with it a large amount of minerals and organic matter.

The characteristics of the longitudinal and the lateral profiles of the river valleys and river beds of the middle Min show a continuous deepened gorge from Nanping, at the end of the reservoir, to Shuikou's Anrenxi. The gradient is steep, over 0.5 per 1,000. The velocity over the various fault planes along the reservoir is fairly rapid, and the velocity of floods is even more rapid. According to the design, calculations were made on the basis of the actual situation of the general floodwaters on 20 May 1969 (the flow at the dam site was 10,156 cubic meters per second), and the result showed that from Nanping at the entrance of the reservoir to the fault plane in front of the dam, the fastest velocity reached 2.22 meters per second; the slowest velocity was 0.37 meters per second. The floodwaters were capable of transporting small particles of silt and organic matter from the reservoir to the lower reaches. It has been pointed out in the design that based on the data of the amount of silt measured in the Min Jiang throughout the years, the median diameter of a suspended silt was 0.03 millimeter, and relative to 0.03 millimeter, the diameter of hydraulic width was 0.0561 centimeter per second. If a granule of silt with the diameter of 0.03 millimeter required 24 hours to sink from the surface to the bottom in still water with the depth of 50 meters, a granule with the diameter of 0.02 millimeter and the diameter of hydraulic width of 0.025 centimeter per second would require 56 hours to sink in the water with the depth of 50 meters.

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1 "Report on Construction and Engineering Problems of the Shuikou Hydroelectric Station by the Fact-finding Meeting" Science and Technology Committee of Fujian Province, PRC 30 Apr 81.

The diameter of the silt's hydraulic width refers to still water only; it is different in the running water of natural river channels. The sinking rate of silt in running water is much more slower than that in still water. In running water, the transmission of the peak flow from the edge of the reservoir at Nanping to the dam site of Shuikou generally requires 5 to 8 hours. After the construction of the dam, the time will be shortened to 3 to 4 hours. Within such a short period of time, small particles of silt and organic matter cannot sink to the bottom of the reservoir, but they are transported by the floodwaters from the reservoir and are discharged to the lower reaches. They are the agricultural manure needed by the farms of the lower reaches. Those deposit along the reservoir are large granules of sand and stone, which are not needed by agriculture.

The water discharged during the low water period is clearer. Basically, it remains the same before and after construction of the station. However, during flood tides, part of the silt in the estuarine section can be transported further into the tidal river section of the Fuzhou Basin; it is part of the source of manure, which remains more or less the same before and after completion of the station. As indicated by the tidal boundary, within the Fuzhou Basin, neap tides can reach Daqiao of Beigang and the area around the Luozhou Jiang of Nangang (Wulong Jiang). Spring tide can retrogress upstream to Houguan (68 km from the mouth of the river) and the area around the river surface. In addition, when the low water flow of the Min Jiang during the low water period is less than 1,200 cubic meters per second (for most part of the year), the average flood tide velocity of the middle and lower sections around Mawei Port and Nangang is slightly faster than that of the ebb tide during spring tides and neap tides. When the low water flow is 308 cubic meters per second, the velocity of flood tide is more rapid than that of the ebb tide. The quantity of inner sand transported by flood tides is much more than the outer sand transported by ebb tides. During spring tides, the amount of inner sand transported at Mawei Port is larger than the amount of outer sand by about 12 percent. In the river mouth section downstream from the gap of the gorge at Min'an Town, the flood tide velocity and the discharge of flood tides with a time unit are larger than those of the ebb tides throughout the year; the amount of inner sand is also larger than that of the outer sand, and the amount is relatively large at Nanzhi Port.

During the low water period, due to the movement of the tidal currents and silt mentioned above, the tidal waters from the river mouth to the areas around Mawei Port are relatively muddy, containing a fairly large quantity of suspended load; the color of water looks like that during the flood period. During spring tides and full tides, the water from Beigang to upstream of Daqiao of Fuzhou is pure. The tidal waters at Nangang and the water retrogressing to the middle and upper sections of the river are fairly muddy. These suspended loads deposit at the ports and along the riverside, forming part of the source of manure.

It is thus evident that, after completion of the station and during high water and low water seasons, in the Fuzhou Basin of the lower Min and the above-mentioned estuarine section, there is sludge which is a source of manure. As

a matter of fact, in recent years, the farms in Fuzhou Basin have not relied much on natural sludge manure. According to a research report by the Huadong Survey Designing Institute, the farms of Fuzhou Basin that relied on the sludge manure for fertilizer dropped from 201,000 mu in the past to 91,000 mu in recent years; because the river mouth has been blocked for fish rearing, the lands along the river have been reclaimed from tidelands for cultivation, the river beds of inland ports have been raised by silting, reversed irrigation from the river is difficult, dredging requires labor, the supply of chemical fertilizers increases day by day, etc. The use of chemical fertilizers and the change in the system of cultivation, the amount of sludge applied to the farms has dropped from 1,000 dan per mu to 500 to 700 dan. This indicates that the significance of using sludge as the source of manure on farms has become less important.

C. Will It Intensify the Siltation in the River Channels of the Lower Reaches and at Mawei Port?

Some comrades believe, "According to the design data, after completion of the hydroelectric station, the discharge of low water will be raised to 300 cubic meters per second, and the water will be cleaner, thus possessing a more powerful scouring force. However, they have neglected the features of the lower Min valley, which takes the shape of an olive with two small ends and a wide middle part. With the scouring action of a comparatively large quantity of pure water, the downward migration of the tidal-affected areas and the narrow river outlets and if the tides hinder the silt from pushing into the sea, siltation will take place along the channels of the Min Jiang downstream from Houguan and at Mawei Port. This will intensify the degree of siltation in the river channels of the lower reaches and at Mawei Port." I believe that the characteristic of the lower Min valley with two small ends but a wide middle part has differential impact on the hydrology of the river, depending on the various seasons and conditions. During the flood period, such characteristic has distinct impact on siltation. Especially during the coincidence of the water discharge of the peak flow and the peaks of the high tides during spring tide in the estuarine section and under the coordinated interaction of Mawei Port and the inverted gorge at Min'an Town at the coast, siltation is even more distinct. At this time, the water-level course line of the estuarine section of the Min Jiang looks even more like the shape of a "saddle." The highest water level of Mawei Port (or tide level) can reach 6.48 meters; the water level at both ends are even higher: downstream from Daqiao of Fuzhou (16 km downstream from Mawei), the highest water level can reach 7.7 meters; Min'an Town (about 10 km upstream from Mawei) is 7.06 meters. The formation of the "saddle-shaped" water-level course line is a result of the flood peak waters of the upper section of Fuzhou Basin pouring downstream to the areas of Mawei Port, which is the widest section of the river. The floodwaters diffuse rapidly, and the water level of the flood peak drops suddenly, but the water level of the lower river section is raised by the peaks of high tides during spring tide at the river mouth. Therefore, the areas of ports and "lakes" between the two peaks are like the floodtide "lake" of the "crest," which is under a relatively still state. Additionally, the sand transported downstream upstream by the peaks of tidal currents from the estuary converge in the areas of ports and "lakes," accelerating the rate of siltation. Under the coordinated

interaction of flood and tide peaks, the amount of water in the ports and "lakes" is especially copious. The larger the floods are or the higher the flood level (or tidal level) is, the more restrictive will the inverted gorge at Min'an Town become in the process of discharging water into the sea during ebbs (or bottleneck effect), thus slowing down the discharge process of floods and sand but facilitating deposition to take place in the flood areas.

However, the situation during the low water period varies. After completion of the station, the discharge of low water has only been raised by 308 cubic meters per second, which cannot be compared with the discharge of floodwaters. Therefore, at this time, the "controlling and restricting" impact played by Mawei Port and the gorge downstream from Mawei Port on the flow can be ignored. It is reflected by the countercurrent process of the floodtides during the spring and neap tide through Mawei Port to the tidal current line of Fuzhou Basin. During the spring tide, the tidal current line generally goes upstream to Houguan. Within the river section of the tidal current line, the water level course line does not look like the shape of a "saddle" as mentioned above during the flood period; it is a one-way current. Because the low water discharge under the tidal effect is much less than the flood discharge, the amount of water discharged to Mawei Port during the ebb is less restricted by the gap of Min'an Gorge than during the flood period. Relevantly, the low tide level of Mawei Port is much lower than that during the flood period, but the tide range is much larger than that during the flood period. Therefore, in the past years, Mawei Port's lowest tide level and largest tide range were recorded during the low water period: the lowest tide level was -0.49 meters, and the largest tide range reached 5.28 meters (Baiyuan Pool).

This is necessary to point out again that during the low water period, no matter it is before or after completion of the station, the general law of tidal movement will not be reversed in the estuarine section of the Min Jiang. Under this condition, the increase or decrease in the low water discharge has an intensifying or weakening impact on the tidal currents at various degrees. That is what the Huadong Hydroelectricity Survey Designing Institute has pointed out, "After completion of the station, the increase in low water is beneficial for washing the mud and sand away from the estuary. It will not have adverse effects on the navigable channels of the lower reaches and Mawei Port."

#### D. Issue Concerning the Impact on the Fishery of the Estuary and Outer Sea Area

Some comrades believe, "The fishing ground, which is 50 nautical miles from the estuary of the Min Jiang, is formed of various kinds of organic matter. They are brought by the scoured silt and muddy waters, which are carried by the floods from a long distance during the flood period to the Min Jiang.... Without the great force of the extraordinarily powerful floodwaters that transport several million tons of bait to the outer sea every year during the flood period, the fishing grounds of Niushan, Taishan and Mazu at the estuary of the Min Jiang will disappear because of the loss of the source of bait." The writer considers that whether there will be significant changes in the impact of runoff and tidal currents of the lower Min Jiang and their interaction on the quality of water



before and after completion of the station is the major precondition in the analysis of this issue. Therefore, a comprehensive analysis is carried out on the following situations:

(1) Flood Period As mentioned above, the floodwaters, which are discharged to the lower reaches before and after completion of the station, basically, carry the minerals and organic matter downstream. In addition, the effect of the floodwaters of the Min Jiang is less felt in the river mouth section than in the estuarine section within the Fuzhou Basin. It remains the same even during the most powerful flood. For example, in the past 30 years, the largest peak flow of the Min Jiang was 29,400 cubic meters per second (Zhuqi) on 19 June 1968. On the same day, Mawei Port (Baiyuan Pool) had the highest low tide level and the smallest tide range (0.75 meter) in the past 30 years. However, it varied in the river mouth section: the smallest tide range at Guantou and Meihua were 1.14 and 1.48 meters respectively on 15 October 1969 during the low water period of the Min Jiang. The smallest tide range within the year was larger than that of Mawei Port. Consequently, the effect of the floodwaters of the Min Jiang on the river mouth area is far less than that on Mawei Port, and the former is mainly and greatly affected by the powerful tides throughout the year. It is evident in the outer sea area, which before and after completion of the station, has been subject to this law.

#### (2) The Balance Between Salt and Fresh Water

Because the river mouth area and the outer sea area are subject to the above-mentioned law before and after completion of the station throughout the year, there is a relevant balance between the salt and fresh waters. Therefore, there is no such issue as "after the completion of the station, the balance between the salt and fresh waters will be destroyed, affecting seriously the migration of fish, and the output of fishery will be seriously lowered in the estuary and outer sea area."

#### (3) The Large and Small Confluents of the Lower Min

The distance from the dam site of the Shuikou reservoir to the river mouth is 129 kilometers. The large and small confluents of the lower reaches of the dam site are Dazhang Xi (the area of the river drainage basin is 4,573 square km; the average flow is 129.6 cubic meters per second; during the extraordinary flood peak, the discharge is equivalent to one third of the floodwaters of the Min Jiang), Mei Xi, Damu Xi, Xiyuan Xi, Yingqian Xi, Shanggan Xi, Panye Xi, etc. All these branches and the floodwaters along the areas of the river banks and between the cities and towns carry the organic matter into the Min Jiang. These conditions remain before and after completion of the station.

#### (4) Flood and Ebb Tidal Currents

The river mouth areas are less affected by the runoff of the Min Jiang, instead, their annual water discharge, tide level, velocity, etc. are under strong tidal influence. At the same time, the velocity of flood tide, the discharge of

flood tide within a time unit, the transportation of inner sand, etc. are generally larger than those during ebb tides. The situation that this small quantity of transported materials is difficult to be transported to the outer sea areas remains more or less the same before and after completion of the station because the outer sea of the Min Jiang is situated toward the upper outlet of the Taiwan Straits. This strait experiences most of the winds and is exposed to strong gales along our coastal areas. On the average, 132.2 days in the year, the gales blow at over 7th to 8th grade. The direction of the prevailing wind is northeast; the wind direction and velocity indicate a relatively distinct locality, stability and continuity. Therefore, outside the river mouth of the Min Jiang, the velocity of flood tides is usually more intense than the velocity of the ebb tides. The winds blow onshore; therefore, the onshore waves are greater than the offshore waves. In addition, the direction and the velocity of the prevailing winds have intensified the southward movement of the cold coastal current along our east coast in winter, which lasts for half a year. The former and latter are under the influence of the revolution and the deflection of the Earth, causing them to blow and drift closer along the coasts of Fujian Province. Therefore, on the one hand, it is difficult for the coastal materials to discharge into the deep-sea; on the other hand, some of the discharged offshore silt move southward and deposit, forming sandspits or small coastal plains parallel to the coast. The east coast of Changle, which is situated south of the mouth of the Min Jiang, is part of the typical and small coastal plain. Some of the farthest off-shore river sand is about 2,000 meters from the coast, thus restricting the outward development of the delta at the mouth of the Min Jiang, but facilitating its reversed development. For example, the development of the largest sandspit plain of Langqi Island at the mouth of the Min Jiang and the series of sandbars at Nanzhi Port is reversed. Thus, in the outer sea areas, there is hardly any supplies of discharged material from the Min Jiang.

To summarize, since the ecological environment remains the same before and after completion of the station and it is especially true in the outer sea areas, the issue that the fishing grounds beyond the mouth of the Min Jiang like Niushan, Taishan and Mazu "will disappear because of the loss of the source of bait" after completion of the station is groundless.

#### (5) Issue of the Source of Fish Bait

Bait comes from various sources; they are not restrictively or mainly from the river or river mouth. It is the same in the fishing grounds distributing beyond the river mouth. Not all the large fishing grounds are found at the river mouth or the outer areas beyond the river mouth; e.g. the fishing grounds of Peru, Hokaido of Japan, Norway, etc. are linked with the ocean currents and sea currents. The Taiwan Straits is also situated on the continental shelf and is affected by the cold and warm currents. The outer sea areas of the Min Jiang form part of the Taiwan Straits and if its fishing ground and fishes' migration and breeding are supposingly affected by the sea currents, what is the necessary relation between them and the construction of the Shuikou hydroelectric station? Of course, this issue awaits further investigation.

## II. The Problem of Siltation in the Reservoir Areas of the Shuikou Hydroelectric Station and Fuzhou Basin

The problem of siltation in the reservoir areas after the completion of the station is related to the major issue of the life of the reservoir. It is necessary to first understand the ratio between the suspended loads and their bed loads and their quantity.

### A. The Problem of Silt in the Min Jiang

Some comrades advocate the argument that, "In the last twenty years, it is obvious that the amount of silt in the Min Jiang has been increasing." Such a statement varies greatly from the data measured and calculated by the Zhuqi hydrological station from 1951 to 1980. The Min Jiang is one of the rivers which contains the least amount of sand in our nation. In the past 30 years, the average sand content has only been 0.135 kg/cubic meter, which is equivalent to one-third of that of the Chang Jiang and 1/264 of that of the Huang He. It is also one of the four major Rivers of Fujian Province (Min Jiang, Ting Jiang, Jiulong Jiang and the Pu Jiang) that has the least content of sand. Additionally, there is no indication that there is an obvious increase in the amount of silt in the Min Jiang year after year. As indicated by the annual transportation of sand in the 30 years--from 1951 to 1980--the largest quantity was 20 million tons (1962); the smallest was 2.72 million tons (1972). For 16 years of the 20 years from 1961 to 1980, the amount of sand transported was under 10 million tons; e.g. in 1978, it was 6.86 million tons; in 1979, it was 5.27 million tons; in 1980, it was 6.02 million tons. As shown by the annual average content of sand, except for 1962 that the content was 0.326 kg/cubic meter, the annual sand content is below 0.3 kg/cubic meter and mostly below 0.2 kg/cubic meter; there were about 10 years that the sand content was below 0.13 kg/cubic meter. From 1951 to 1977, the average annual sand content was 0.143 kg/cubic meter. From 1951 to 1980, the average annual sand content was 0.135 kg/cubic meter. There is a relation between the changes in the amount of sand and silt and the changes in the annual flood discharge and annual total water discharge in all years.

### B. Issue of the Quantity of Bed Loads of the Middle Reaches

Concerning the statement that "there will be a greater amount of bed loads," there is neither reliable evidence nor correct theoretical basis. In hydrology, the quantity of bed loads of a river is less than that of the suspended loads. The relation between the bed loads and suspended loads is

$$R(\text{Bed Load}) = BR(\text{Suspended Load})$$

The value of B is as follows: the river on a plain ranges from 0.01 to 0.05; the river of a hill ranges from 0.05 to 0.15; the river in a mountainous area ranges from 0.15 to 1.

The general conditions of the vertical and horizontal profiles of the river valleys and river beds of the middle reaches are closely related to the sliding of the bed loads.

Overall, the middle reaches of the Min Jiang are continuous gorges. They are not those continuous gorges that are simple and straight with conformity in the width of the upper and lower sections. Although the gradient of the river beds is steep, it does not exceed 1 per 1,000. Both river sides of the middle reaches of the Min Jiang belong to an intense uplifting zone caused by the new structural movement of the province. The unequilibrium in the intensity and range of uplifting is absolute, and equilibrium is relative. Relevantly, the vertical and horizontal profiles of the gorges of the middle reaches reflect that their development is mainly of unequilibrium with various widths: generally, the middle and upper sections are larger than the lower section like an inverted canyon. In addition, it is a typical deepened canyon.

Upstream from the Shuikou dam site, the river course is narrow and sinuous with pronounced concave and convex banks. There are rocks, and the river bed is not smooth. From the movement of the flow, there are rapid sections; and relatively, there are slow flow sections and some retrogressive flows; the meandering range of the major flow line is considerable. As reflected by the work of the river, obviously, there are transportation, scouring and deposition. The gradation of the river (it is a mountainous river not a turbulent flow among hills), in combination with the above-mentioned crisscross and complicated river beds and river channels, acts differently on the transportation and sliding of the suspended loads and bed loads. Even in the rapid section that intensifies the work of scouring and sliding, it is hard to state that all the big and small, coarse and fine beds loads can be transported or can enter the Fuzhou Basin. This phenomena are even more so in the slow flow sections and retrogressive sections. If during a relatively long low water period, the dry rocky river beds, which cover a vast area of the middle reaches, will be exposed, showing a large quantity of bed loads such as gravel, pebble, coarse sand, etc. Thus, not "almost all the loads enter the Fuzhou Basin." Even so, if all the bed loads of the middle reaches can enter the Fuzhou Basin, because the area of Fuzhou Basin is the largest in the drainage basin of the Min Jiang and the gradient of its base level plain is the smallest, deposition is the major work of the river. It is difficult for the relatively coarse loads to be transported continuously within a year or years via such a long distance to Mawei Port (the distance from Shuikou to Mawei is 100 km) which is situated at the lower edge of the Fuzhou Basin. Under such circumstances, it is hard to say whether the gorges downstream from Mawei Port to the estuary will have anything to do with the bed loads from the middle reaches. If a comprehensive analysis is conducted on the component and structure of the materials of the flood land, sand bars, sandspits, sand banks, etc. which are widely distributed over the Fuzhou Basin, it is not difficult to find that the silt deposited at the bottom of Fuzhou Basin is mainly the suspended loads from the middle reaches.

The paddy fields, which distribute on both banks of the Min Jiang of Fuzhou Basin and on the crisscross, braided plain, spread mainly on the sedimentary layers of clay. On the other hand, during the flood period of the Min Jiang, the sand content of the river is the largest and the transportation rate of sand is the fastest. Every time, when the floodwaters subside, especially before construction of the dam, the lowlands along the banks of the lower Min

are affected by the floodwaters. After the retreat of the floodwaters, suspended sediments are left behind. They are the source of sludge manure for the farmland of Fuzhou Basin.

In addition, the suspended loads transform into bed loads and deposit on the basin. It is not due to the "flocculation of the salt and fresh waters" because the conditions favorable for the flocculation of the salt and fresh waters require a salt content of over 1 to 2 per 1,000. The most intensifying condition is when the salt content is between 3 to 10 per 1,000. Such salt content can only be found at the mouth of the Min Jiang, same as the position of the sand blocking the river mouth, and it has no relation with the Fuzhou Basin. Within the Fuzhou Basin, the largest salt content of the section of Maweiluoxingta River was only 0.12 per 1,000; the salt content of the gorge at Min'an Town, 10 km downstream from Mawei, did not exceed 0.57 per 1,000. As a matter of fact, it only took place under the conditions when the water discharge of the Min Jiang was extrarodinary low and when the spring tide and full tide coincided. Under such conditions, upstream from Min'an Town, there was the retrogression of fresh tidal waters. Additionally, the deposition of bed loads of Fuzhou Basin mainly concentrated during the overflow stage or flood period when the river discharged and the amount of sand of the Min Jiang were the largest; e.g. the flow of runoff during the 6-month flood period tood 88 percent of the runoff of the whole year; the amount of sand transported took 92 percent.

The statement concerning the completion of the Shuikou reservoir is open to question; "the original environment with turbulent flows will turn into an environment with relatively stable still water within the reservoir, and most of the suspended loads will transform into bed loads and deposit underneath the reservoir, and the amount is considerable." As mentioned above, the Min Jiang is a river with low sand content; its average annual sand content is only 0.135 kg/cubic meter, and the water capacity of the regulatory reservoir is only 700 million cubic meters, which is 1.28 percent of the average annual water amount of the hydroelectric station at dam site (54.5 billion cubic meters). The way of operation during flood periods is runoff method. During the flood period, there is sufficient discharge and velocity to discharge most of the silt to the lower reaches. Inside the reservoir, there is only part of or a small amount of the suspended loads transforming into bed loads. In addition, two hydroelectric stations--Ansha and Chitan--of the upper reaches of the Min Jiang have been repaired and constructed, and Shaxiko and Jiemian hydroelectric stations will be constructed. The reservoirs of these hydroelectric stations will try to retain all the bed loads and part of the suspended silt and will reduce the amount of silt entering the reservoir of Shuikou. According to calculation, after 30 years; operation, the quantity of desposition will amount to about 80 million cubic meters, occupying 3.4 percent of the total capacity of the reservoir. The effect is not serious.

### III. Conclusion

To summarize the characteristics and hydrological features of the middle-lower reaches of the Min Jiang, the construction of the Shuikou hydroelectric station

will not have adverse effects on the ecological environment of the middle-lower reaches.

A. During the flood period, a considerable discharge of floodwater along the middle reaches will continue. A large amount of silt will also be discharged along the lower reaches. During the low water period and during the flood tide at the estuary, part of the silt will be discharged to a certain current-affected section of the Fuzhou Basin. Such silt is a component part of the manure source of the farmland in Fuzhou Basin.

B. The low water discharge of the lower reaches, during the low water period, increases. It will not reverse the general law of the tidal current movement in the estuarine section, but it will facilitate the fresh water irrigation of farms on the plain of the lower reaches and will facilitate the inland water navigation.

C. The total amount of the suspended loads is much larger than that of the bed loads. Most of the suspended loads of the middle reaches will discharge outside the dam; the deposition inside the reservoir is not serious. Henceforth, if afforestation is stressed in the areas of the upper and middle reaches, the soils will be conserved.

D. Before and after completion of the station, the ecological environment of the estuarine section of the Min Jiang and its outer sea areas are alike. Construction of the station will have no obvious effects on the migration of fish and the fishing production of these areas, etc. Concerning the fishing grounds of the outer sea areas, there will not be the phenomenon that "they will disappear because of a shortage of the source of bait."

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12726

CSO: 4008/354

## ENVIRONMENTAL QUALITY

### FORESTRY MINISTRY ISSUES AFFORESTATION CIRCULAR

OW120843 Beijing XINHUA in English 0826 GMT 12 Feb 85

[Text] Beijing, 12 February (XINHUA)--China hopes to plant even more trees this spring, according to a circular issued here today by the Ministry of Forestry.

The circular calls for mobilizing the people to participate in the drive. It also stresses scientific planting to raise the quality of the forestry work.

The circular also urged forestry departments to increase the supply of saplings and seeds, and improve quarantine work to prevent the spread of disease and harmful insects.

CSO: 4016/92

## ENVIRONMENTAL QUALITY

### ENVIRONMENTAL SANITATION PRACTICES TO BE UPGRADED

OW251148 Beijing XINHUA in English 1135 GMT 25 Feb 85

[Text] Beijing, 25 February (XINHUA)---China is determined to tackle the problem of mounting garbage and the pollution threat therefrom, an environmental protection official said here today.

The amount of rubbish and other wastes had been increasing by almost 10 percent annually over the past 4 years in 27 cities including Beijing and Shanghai, he said.

Each of the six million urban residents in Beijing threw away two kilograms of garbage a day and there were now several thousand rubbish hills in the suburbs, he added.

He also mentioned the threat posed by inadequate sewerage systems to underground water supplies in some places.

Worried about the threat to public health, the official said, the ministry of urban and rural construction and environmental protection was launching a three-point program to counter the problems.

Steps are being taken to sort out different categories of rubbish, so that harmful items will be disposed of properly while the rest burnt, buried or processed.

Efforts will be made to step up the recycling of wastes. The amount of rubbish recycled in Beijing is only about 10 percent of the total at present.

More and better public lavatories and treatment plants will be built and existing sewerage systems improved to link more homes to sewers.

Only about 5 percent of all wastes is treated at present while the rest is moved directly to the countryside and used for manure, according to the ministry.

The ministry also called for cleaning vegetables before sending them to city markets, the official said. This would reduce the amount of waste from urban areas, he added.



China expected to have 40 percent of all wastes treated by 1990 and 100 percent by the year 2000, the official said.

The amount of money spent on environmental sanitation and the number of motor vehicles used for garbage disposal had almost doubled over the last 5 years, he said.

CSO: 4016/92

## ENVIRONMENTAL QUALITY

### SOUTH CHINA LAUNCHES SPRING TREE-PLANTING DRIVE

OW141245 Beijing XINHUA in English 1219 GMT 14 Feb 85

[Text] Beijing, 14 February (XINHUA)--The annual spring tree-planting drive is now spreading across South China, according to today's PEOPLE'S DAILY.

More than 52,600 hectares have been already been planted in Guizhou Province, the paper said. Another 5.68 million new trees have been planted around houses and villages and along roadsides and river banks.

Tree planting is also going well in Hunan Province. By the end of last week, afforestation had been completed on 68,000 hectares, a three-fold increase over the same period of last year.

The Guangxi Zhuang Autonomous Regional Forestry Department plans to seed trees aerially on 153,000 hectares in 11 counties between Nanning and Yuling prefectures. More than 60,800 hectares were seeded this way in late January.

The current policy is one of trees belonging to whoever contract to green the mountains. It has given an impetus to tree planting, the paper said.

While encouraging individuals to plant trees, Jiangxi and Hubei provinces are paying attention to promoting the planting of even more trees by state and collective farms.

About 70,000 hectares of land have been prepared for tree planting by state and collective farms in Jiangxi, 49 percent of the projected hectarage for this year. In Hubei 59 percent of the land to be planted to trees this year had already been prepared.

The drive to plant trees is developing unevenly across South China, the paper pointed out. More peasants should be mobilized to do this work in January and February.

CSO: 4016/92

## ENVIRONMENTAL QUALITY

### BRIEFS

JILIN AFFORESTATION--In 1984, Jilin Province had afforested 4.761 million mu, overfulfilling the afforestation plan by 90 percent. [Excerpt] [Changchun JILIN RIBAO in Chinese 22 Jan 85 p 1 SK]

FUJIAN AFFORESTATION--Fujian Province has made remarkable achievements in spring afforestation this year. By 10 February, 1,619,900 mu of land had been afforested. [Summary] [Fuzhou Fujian Provincial Service in Mandarin 1130 GMT 17 Feb 85 OW]

CSO: 4008/245

AUTHOR: LIU Liangdong [0491 5328 2767]

ORG: None

TITLE: "The Steady Movement and Stability of Spinning Spacecraft with Cavities Filled with Liquid"

SOURCE: Beijing YUHAN XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS] in Chinese No 4, 31 Oct 84 pp 13-29

TEXT OF ENGLISH ABSTRACT: Rumyantsev derived the stability condition of the spin motion of a rigid body with cavities partially filled with liquid around a fixed point, that is  $I_z > I_x + I_1$ . This paper extends his method and derives the stability condition for spinning spacecraft with cavities partially filled with liquid, that is  $I_2 > I_x + I_2$ .  $I_1$  and  $I_2$  are positive definite functions of the spacecraft parameters. Typical examples demonstrate that the difference between  $I_1$  and  $I_2$  could be significant for certain parameters. This paper also presents a steady state solution of the spin motion under the assumption that the cavities are positioned symmetrically about the spin axis with slight errors. It is pointed out that the dynamic imbalance is amplified due to fluid migration between the cavities.

The second part of this paper derives the general solution of stability conditions for three different types of communication between cavities. The influence of pressed gas in the cavities on stability is taken into account for simple connected cavities.

AUTHOR: YANG Weiyuan [2799 4850 0997]

ORG: None

TITLE: "Finite Multiple Burn Orbit Transfer Error Analysis via Covariance Matrix"

SOURCE: Beijing YUHAN XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS]  
in Chinese No 4, 31 Oct 84 pp 30-43

TEXT OF ENGLISH ABSTRACT: The finite multiple burn method is used for the transfer from the space shuttle low earth orbit to the geostationary orbit with low accelerations. In this case, the study of orbit transfer insertion errors becomes very complicated. Generally speaking, an analytical method via a covariance matrix is not suitable--a semi-analytical method or digital method must be employed. It is pointed out after detailed discussion that it is feasible for perigee burns to adopt the semi-analytical method and for apogee burn to adopt the analytical method in order to save computation time.

This paper describes the propagation matrices of perigee burns, apogee burn and coast phase, and also provides a transfer matrix for orbit element error. In addition, the flow chart and verification methods of the program are discussed in detail. Finally, an example is given.

## Astronautics

AUTHOR: JIANG Yunzheng [3068 0336 2973]

ORG: None

TITLE: "A Method of Forecasting Active Constraint with Applications to Structural Optimization"

SOURCE: Beijing YUHANG XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS] in Chinese No 4, 31 Oct 84 pp 44-54

TEXT OF ENGLISH ABSTRACT: A new approach to forecasting active constraint in an optimization problem is proposed in this paper. The active constraints are chosen according to the projective direction in which the objective function gradient projects on the intersection of active constraints chosen before. The number of active constraints is gradually increased until the cone, which is obtained by the gradient vector of these linearly independent active constraints, can contain the objective function gradient.

After establishing the explicit representation of the constraints, this method is employed in the DJY-2 structural optimization program similar to the ACCESS 1. The high quality linearization of constraints and precision method of forecasting active constraints enable us to get almost identical active constraints in several adjacent iterations, thereby raising the computing efficiency.

A space truss with 25 bars and 72 bars, a box-wing with 18 elements and a delta-wing with 133 elements are calculated and the results obtained are satisfactory. It is shown that this method for forecasting active constraint has improved the computation efficiency considerably.

9717

CSO: 4009/86

AUTHOR: QIU Guangshen [8002 0342 3947]

ORG: None

TITLE: "A New Method of Rocket Nozzle Design"

SOURCE: Beijing BINGGONG XUEBAO [ACTA ARMAMENTARII] in Chinese No 4, Nov 84  
pp 40-49

TEXT OF ENGLISH ABSTRACT: A new method of solid propellant rocket nozzle design is presented. The method, based on the theory of non-symmetric flow in the Laval nozzle, aims first at the angle of reducing the gas dynamic misalignment and then at the angle of efficiency. It does not contradict the traditional methods of nozzle design, but instead supplements them. It will help reduce the dispersion of impact of the free flight rocket.

Engineering

AUTHOR: XI Yonghui [1153 3057 6540]  
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TITLE: "Model DZC-1 Projectile Nutation Angle and Nutation Angular Velocity Measuring Device"

SOURCE: Beijing BINGGONG XUEBAO [ACTA ARMAMENTARII] in Chinese No 4, Nov 84 pp 50-57

TEXT OF ENGLISH ABSTRACT: In this paper we present our development of the DZC-1 measuring device in which a modulated Q-laser, characterized by higher frequency, higher energy and narrower bandwidth of impulsive flashes, is included as its essential element. This device can clearly record, on a single sensitized dry plate, two instant images of a projectile at various nutation angles, thus introducing a new method for the measurement of projectile nutation angles and nutation angular velocities.

This paper is mainly devoted to the description of operation principles, basic structures and features, and technical characteristics of the DZC-1 device, as well as the presentation of pictures of projectiles of different behaviors. Finally, a simple method for calculating nutation angles and some calculation results are also presented.

9717

CSO: 4009/87



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TITLE: "Research on Laser-Plasma Interaction in China in the Last 10 Years"

SOURCE: Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese  
Vol 11 No 11, 20 Nov 84 pp 641-647

TEXT OF ENGLISH ABSTRACT: Research on laser-plasma interaction in China has been conducted in parallel with the high power laser technique. Since 1964 the high power Nd:glass laser system has been developed, and the laser breakdown and laser-focusing in the plasma have been observed by focusing a  $1.06\text{ }\mu\text{m}$  laser beam in the atmosphere. In 1973, frozen deuterium and LiD,  $\text{CD}_2$  plate targets were irradiated by a  $10^{10}\text{W}$  laser beam, and a neutron yield of  $1 \times 10^3/\text{shot}$  was obtained. In 1974, with a  $10^{11}\text{W}$  laser beam shotting on  $\text{CD}_2$  plate targets, the anomalous laser absorption and hard X-ray emission from plasma were observed, with neutron yield of more than  $2 \times 10^4/\text{shot}$  obtained. From 1975-1980, the compression of glass microballoon targets was observed by using the six-beam laser facility. Moreover, many laser-plasma interaction experiments, such as second harmonic emission, X-ray line spectrum diagnostics, K-edge absorption measurements for electron temperatures, and Faraday cup charge collectors for particle measurements, were carried out.

Lasers

AUTHOR: ZHANG Meizhen [1728 2734 3791]  
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TITLE: "Lasing Characteristics of High Quality Nd:YAG Crystals Grown by Temperature Gradient Technique"

SOURCE: Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese Vol 11 No 11, 20 Nov 84 pp 665-666

TEXT OF ENGLISH ABSTRACT: A Nd:YAG crystal of  $\phi 5 \times 50$  mm in size was grown by the temperature gradient technique. It has good optical homogeneity (the interference fringe number is zero) and an efficiency of 1 percent at 1 or 2 pps. It can easily be operated in the TEM<sub>00</sub> mode.

9717

CSO: 4009/96

AUTHOR: LIANG Peihui [2733 1014 6540]

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TITLE: "Space-Time Analogy in the Generation and Propagation of Ultrashort Pulses"

SOURCE: Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese  
Vol 11 No 12, 20 Dec 84 pp 715-717

TEXT OF ENGLISH ABSTRACT: Space-time analogy relation was applied to discuss the generation and propagation of ultrashort laser pulses. By the analogy between the diffraction of gratings and the generation of pulses, the results of pulse shape and satellite lines have been derived directly, and in terms of the analogy between the diffractive spread in free space and propagation effects of ultrashort pulses in a medium with group velocity dispersion, pulse width broadening, chirp and their compensation with phase conjugated mirrors are discussed.

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TITLE: "A New Method Using a Right Angled Prism Coupler"

SOURCE: Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese  
Vol 11 No 12, 20 Dec 84 pp 725-726, 721

TEXT OF ENGLISH ABSTRACT: Using a right angled prism coupler, simultaneous excitation of both transmission strip and m-line of the waveguide mode has been realized; therefore, the right angled prism coupler has the coupled characteristics of the symmetrical prism. Theoretical analysis has been made and the measuring method and results are given.

9717

CSO: 4009/95

AUTHOR: WU Cunkai [0702 1317 1956]  
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TITLE: "Proposed Schemes of Compensation for Phase Distortions in Laser Amplifier by Using Degenerate Four-wave Mixing"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 4 No 10, Oct 84 pp 918-923

TEXT OF ENGLISH ABSTRACT: Two schemes of compensation for phase distortions in the laser amplifier have been proposed and experimentally demonstrated by using degenerate four-wave mixing. In the first scheme, BDN dye solution in dichloride ethane was used as the nonlinear medium and the saturable absorber was put outside the laser oscillator. Using polarization discrimination, phase compensated output was coupled from the Nd:YAG laser system. The backward wave output amplified about four times was experimentally obtained. In the other scheme, a phase conjugate mirror was put inside the oscillator cavity. The BDN dye solution was used as the degenerate four-wave mixing and the Q-switching medium as well. Q-switched output compensated for phase distortions in the amplifier. The property of compensating for phase distortions was investigated. The laser output as a function of the concentration of BDN dye solution was measured.

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TITLE: "Investigation of Defects in  $\text{BeAl}_2\text{O}_4\text{:Cr}$  Crystals"\*

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 4 No 10, Oct 84 pp 924-932

TEXT OF ENGLISH ABSTRACT: The defects of alexandrite crystal ( $\text{BeAl}_2\text{O}_4\text{:Cr}$ ) grown by the Chochralski technique were investigated by chemical etching, optical microscopy, X-ray diffraction topography and electron microprobe analysis.

The results obtained are summarized as follows: (1) Rolicdle dislocation etchants were established on the (1 0 0), (0 1 0) and (0 0 1) surfaces. (2) The distributions of dislocations in crystals are nonuniform. There are two sources for the dislocation production. One is seed and the other is inclusions. Most of the dislocations are edge ones, with Burger's vectors in the  $\langle 1\ 0\ 0 \rangle$  direction and glide planes of (0 1 0). (3) The main inclusions, such as bubbles, tunnels and secondary phase precipitate particles, often appear in grown crystals, and are caused by impurities in raw material and constitutional supercooling during growth.

\* This paper was presented at the 1983 ICL (Guangzhou, China).

9717  
CSO: 4009/92

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TITLE: "Invasive Systemic Infection in Patients with Extensive Burns:  
Analysis of 134 Cases"

SOURCE: Beijing ZHONGHUA WAIKE ZAZHI [CHINESE JOURNAL OF SURGERY] in Chinese  
No 8, 22 Aug 84 pp 449-452

TEXT OF ENGLISH ABSTRACT: Clinical analysis of 134 cases of burned patients revealed that the decrease of the incidence of invasive systemic infection (ISI) and the improvement of the surgical recovery rate of these patients are related to the following factors: (1) effective control of severe complications, such as shock, renal failure, etc.; (2) topical use of silver sulfadiazine for wound infection; (3) timely excision of eschar and skin grafting; and (4) rational use of proper antibiotics for prophylaxis.

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TITLE: "An Investigation of the Bacterial Flora in Burn Wards"

SOURCE: Beijing ZHONGHUA WAIKE ZAZHI [CHINESE JOURNAL OF SURGERY] in Chinese  
No 8, 22 Aug 84 pp 453-455

TEXT OF ENGLISH ABSTRACT: Weekly bacterial culture samples were taken from the utensils of the burn wards, the patients' wounds, and the anal orifice, nostrils and finger tips of both the patients and the medical staff. The staphylococcus and Pseudomonas aeruginosa were isolated, identified and typed. The carrier rates of patients and hospital staff, the infection rate of wounds, the contamination rates of the environment and utensils were determined. The cross infection rate of the staphylococcus aureus was 27.6 to 34.5 percent, and that of Pseudomonas aeruginosa 34.5 percent. The staphylococcus aureus bacteriophage types of most of the strains isolated were of the lytic group III and its patterns of bacteriophage type were mainly 6/47/54/83 A and 80/81. The Pseudomonas aeruginosa serotype of most of the isolated strains was type I.



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TITLE: "Experimental Study of Therapeutic Effect of Chemical Antimicrobial Agents Against Local Burn Infection"

SOURCE: Beijing ZHONGHUA WAIKE ZAZHI [CHINESE JOURNAL OF SURGERY] in Chinese No 8, 22 Aug 84 pp 456-458

TEXT OF ENGLISH ABSTRACT: Antimicrobial agents effective against Pseudomonas aeruginosa were selected from 17 chemical agents by a drug sensitivity test. Silver aspartate and silver nicotinate proved most sensitive. Both of the drugs together with silver 2-sulfahydryl-4-nitro-pyridine-N-oxide, an agent of proved potency, and the recently composed pipemidic acid and silver pipemidate were used as a topical cream. There were 20 mice in each group with tails scalded to deep II degree burns. The wounds were seeded with Pseudomonas aeruginosa one hour postburn, and were treated with an injection of topical cream into a plastic tube enveloping the scalded tails five hours postburn. Number and time of natural death, and postmortem heart blood culture were observed. There were 19 deaths in each of the control and cream base groups with positive Pseudomonas aeruginosa cultures, while only 1-5 deaths were observed in the various therapeutic groups with mostly positive heart blood cultures. Silver pipemidate and silver nicotinate proved to be the most effective.

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TITLE: "The Serotypes of 192 Strains of Pseudomonas Aeruginosa Isolated from Burn Patients"

SOURCE: Beijing ZHONGHUA WAIKE ZAZHI [CHINESE JOURNAL OF SURGERY] in Chinese No 8, 22 Aug 84 pp 459-460

TEXT OF ENGLISH ABSTRACT: Pseudomonas aeruginosa is still the chief pathogen of infection in burn patients. From October 1981 to June 1982, 192 strains of P. aeruginosa were isolated from burn patients in our center. We were able to identify 95.8 percent of these strains by the slide agglutinating test with 12 diagnostic serotypes of standard serum (Chengdu Biological Product Institute). The P. aeruginosa serotype I was most commonly isolated from burn patients in our center (41.2 percent), followed by serotypes II (15.6 percent) and XI (10.9 percent). Seventy strains of P. aeruginosa were tested for sensitivity to 17 antibiotic agents, with the most resistant strain being serotype I and the multiple agglutinating serotype. All of these were sensitive to amikacin and polymixin-B. These two types accounted for 52.1 percent of the P. aeruginosa isolated from our unit.

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TITLE: "Experimental Study and Clinical Observation of Glutaraldehyde-  
treated Skin Grafts"

SOURCE: Beijing ZHONGHUA WAIKE ZAZHI [CHINESE JOURNAL OF SURGERY] in Chinese  
No 8, 22 Aug 84 pp 461-463

TEXT OF ENGLISH ABSTRACT: An experimental study of glutaraldehyde (GA)-treated skin grafts was carried out on rabbits. The allografted 0.3 percent GA-treated rabbit skin, which had been stored for 5 months at  $-25^{\circ}\text{C}$ , could stay on the excised wound for  $33.6 \pm 2.69$  days.

Twenty-seven patients, aged 1-50 years with 2-85 percent TBSA burned, were observed after the application of GA-treated porcine skin. The GA-treated porcine skin was retained on the host for an average of  $22.1 \pm 8.17$  days. No adverse reactions were observed. The healing of the wounds covered with GA-treated porcine skin was satisfactory.

After 7 months of storage at  $-25^{\circ}\text{C}$ , the preserved skin remained pliable and its structure was maintained.

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TITLE: "Gastric Acid Secretion, PGE Concentration and DNA Synthesis of Gastric Mucosa in Burned Rats"

SOURCE: Beijing ZHONGHUA WAIKE ZAZHI [CHINESE JOURNAL OF SURGERY] in Chinese  
No 8, 22 Aug 84 pp 464-467

TEXT OF ENGLISH ABSTRACT: The gastric acid secretion, PGE concentration and DNA synthesis of gastric mucosa were determined in burned rats. Curling's ulcer without hyperacidity was found 24 hours after the injury. The incidence and lesion index were, respectively, 75 percent and  $13.2 \pm 2.9$ , both being significantly higher than those of the control group. The PGE concentration in gastric mucosa decreased 24 hours after the injury, while there was a sharp increase 12 hours after the burn; the latter is believed to be a compensatory response to stress. Indomethacin, which is an inhibitor of enzymes that transforms arachidonic acid into PGS, can increase the severity of gastric mucosal damage in burned rats. This elucidates the effect of endogenous PGE in maintaining the defense mechanism of gastric mucosa. The DNA synthesis of gastric mucosa began to decrease 4 hours after the injury and the lowest level lasted for 24 hours. The decreased PGE concentration and reduced DNA synthesis of gastric mucosa in burned rats lead to the impairment of the mucosal defense mechanism.

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TITLE: "Dynamic Change in Serum Osmolality and Colloidal Osmotic Pressure  
in Burn Patients"

SOURCE: Beijing ZHONGHUA WAIKE ZAZHI [CHINESE JOURNAL OF SURGERY] in Chinese  
No 8, 22 Aug 84 pp 468-471

TEXT OF ENGLISH ABSTRACT: The serum osmolality and colloidal osmotic pressure were measured in 22 hospitalized burn patients. The mean value of serum osmolality determined by freezing point depression in 60 healthy persons (donors) was  $285 \pm 7.0$  (S D) mOsm/kgH<sub>2</sub>O, while that of 16 patients (burn area 26-97 TBS/III° 0-92 percent) was greater than 305 mOsm/kgH<sub>2</sub>O during the first three postburn days. Two patients who died in the early period after injury were found to have a prolonged elevation in serum osmolality up to the time of death. During the first 4-50 days following the burn, the level of serum osmolality in the majority of patients returned to normal or to even lower than normal. However, a recurrence of the hyperosmolal state was observed in three extensively burned patients (90-97 TBS/III° 80-92 percent).

Eight extensively burned patients were found to have an osmolal discrepancy (determined osmolality-calculated osmolality) greater than 40 mOsm/kgH<sub>2</sub>O. The osmolality discrepancy in five nonsurvivors of this group remained high until death, while in three survivors it returned to normal levels gradually.

The mean serum colloidal osmotic pressure of 125 healthy adults was  $26.6 \pm 1.72$  (S d) mmHg. In all patients with a burn surface area greater than 20 percent TBS, the level of serum colloidal pressure was lower on the first postburn day, and it remained low for about 60 days. The results correlated well with the changes in serum albumin levels.

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TITLE: "Use of Pedicled Myocutaneous Flaps for Coverage of Electric Burn Wounds Involving Joints and Major Deep Structures"

SOURCE: Beijing ZHONGHUA WAIKE ZAZHI [CHINESE JOURNAL OF SURGERY] in Chinese  
No 8, 22 Aug 84 pp 472-475

TEXT OF ENGLISH ABSTRACT: The wounds of 12 cases of electric burns involving the joints and other major deep structures were treated with pedicled myocutaneous flap coverage immediately following debridement. In addition to primary repair of the wounds, these flaps, in contrast to cutaneous ones, provide stronger resistance to infection. Partially devitalized tissues can be revascularized by a better blood supply which is offered by myocutaneous flaps. The muscles used were gastrocnemius, tensor facia lata, latissimus dorsi, pectoralis major and abductor hallucis in four, three, two, two and one cases respectively. Eleven flaps healed up per primam, while infection occurred in one which also healed following incision and drainage. In all, six joints were involved: four recovered completely and two suffered slight limitations in motility.

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CSO: 4009/82

GROUP TALLIES 1984 INFORMATION PRODUCTS EXPORTS

OW010441 Taipei CNA in English 0252 GMT 1 Feb 85

[Text] Taipei, Jan. 31 (CNA)--The Republic of China's exports of information industry products last year probably exceeded U.S. dollar 1 billion, the Institute for Information Industry said Thursday.

Triple-I [Institute for Information Industry], a government-sponsored non-profit organization, indicated that in the first 11 months of last year, the sales of these products to foreign countries totaled U.S. dollar 890 million. It added that the exports of information industry products usually reach a seasonal climax in December. The export volume of these products last December, in all likelihood, surpassed U.S. dollar 100 million in value, it pointed out.

By category, the exports of microcomputers enjoyed the highest growth rate, 801 percent. This eight-fold growth came on the strength of 500,000 units exported in the first 11 months of 1984, the institute stated.

In addition, the exports of computer components were maintaining a steady rise, accounting for 16.8 percent of the total in November, 6.8 percent above that at the beginning of 1984. Exports of monitors accumulated to 2.5 million units in the first 11 months of last year, the institute revealed.

The annual production of computer hardware is set to reach U.S. dollar 3.9 billion by 1989, with an annual growth rate of 30 percent, it stated.

CSO: 4010/72

TAIWAN

BRIEFS

COMPUTER OPERATING SYSTEM DEVELOPED--Taipei, 5 Feb (CNA)--The Electronics Research and Service Organization (ERSO) under the Industrial Technology Research Institute has successfully developed a computer operating system, MITOS, which can be applied to office or factory automation as well as military purposes. MITOS (Made in Taiwan Operating System) is the brain child of experts with ERSO, the National Science Council, Academia Sinica, National Taiwan University, National Chiaotung University, National Tsinghua University, National Cheng Kung University and other departments of the Industrial Technology Research Institute. ERSO director, Yang Ting-yuan, said that MITOS signifies a technological breakthrough of the domestic computer industry which will contribute tremendously to the production of microcomputers and peripherals. The MITOS project had mobilized experts of all domestic research (?institutes), said Irving T. Ho, director of the Institute of Information Industry. While doing research and development on the first computer operating system, Ho said the domestic information industry also cultivated many specialists. [Text] [Taipei CNA in English 0343 GMT 6 Feb 85 OW]

CSO: 4010/77



HONG KONG MEDIA ON CHINA

PRC APPLIES FOR WORLD PATENT ORGANIZATION MEMBERSHIP

HK Hong Kong SOUTH CHINA MORNING POST in English 31 Jan 85 Business News  
Supplement p 3

[Article by Olivia Sin]

[Text] China will become a member of the Paris Convention for the Protection of Industrial Property, a world patent organisation, by March, according to a Chinese patent official, Mr Liu Gushu. Mr Liu, who is also the general manager of China Patent Agent (HK), said the application to join the group was made last month.

By joining the convention, China hopes foreign countries will develop greater confidence in its newly-established patent system.

Mr Liu said he expected China would receive about 3,000 patent applications from foreign firms and individuals this year. He urged foreign firms to submit their applications before China's patent law was enforced on April 1.

China Patent Agent, which was established last year, is one of three organisations authorised by the Chinese Government to accept patent applications. The others are the Peking-based patent agency of the China Council for the Promotion of International Trade and the Shanghai Patent Law Firm.

Mr Liu said he believed his Hong Kong-based office would gain most of the business because Hong Kong offered efficient and convenient services. "Besides, foreigners need visas to go to Peking and Shanghai and this may cause them a delay in filing applications," he said. By contrast, entry to Hong Kong is much simpler.

Mr Liu said his office would also launch a quarterly publication in April to introduce China's patent system. The bilingual CHINA PATENTS AND TRADEMARKS will be published in Hong Kong. The director of the local branch of the NEW CHINA NEWS AGENCY, Mr Xu Jiatun, will be the publication's honorary director.

Mr Liu said foreigners had expressed concern about their patents being copied by stateowned corporations in China. He said such cases would be dealt with at two levels in China--by the patent offices in the various provinces or the People's Court. Those found guilty would be fined or jailed, he said.